B6800-1A

NUEXCO

APRIL 1986 NUMBER 212

MONTHLY REPORT

ON THE NUCLEAR FUEL MARKET

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MONTHLY REPORT ON THE NUCLEAR FUEL MARKET

April 1986 No. 212

GEORGE WHITE, JR., *EDITOR* CLARK M. BEYER, *ASSOCIATE EDITOR*

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NATURAL URANIUM AND SECONDARY MARKET CONVERSION

(All data as of March 31, 1986)

The **Exchange Value** is **$17.25** per pound U_3O_8, up $0.25 since last month. **Active supply** of natural uranium (concentrates and UF_6) for spot or near-term delivery totals **2,525,000** pounds U_3O_8 equivalent, up 120 thousand pounds since last month. The corresponding figure for **active demand** is **950,000** pounds, down 25 thousand pounds. The spot and near-term **supply-demand ratio** increased to **2.7:1.**

The *Current Market Data* section of this Report lists three natural uranium sales and two of enriched uranium, involving approximately 500,000 pounds equivalent U_3O_8. All of the transactions involved near-term delivery and two met the criteria for inclusion in the current Transaction Value calculation. Three transactions involved natural UF_6.

The **Transaction Value** is **$16.70** per pound U_3O_8, unchanged since last month. The calculation extends over a 6-month period and includes 18 transactions involving 2.7 million pounds equivalent U_3O_8.

The **UF_6 Value** is **$48.00** per kilogram U in UF_6, unchanged since last month.

The **Conversion Value** is **$1.80** per pound U in UF_6, unchanged since last month. Active supply of secondary market conversion services for delivery within three years totals 975 thousand pounds U as UF_6. Active demand totals 950 thousand pounds U as UF_6. No secondary market conversion transactions are reported.

The **Loan Rate** is unchanged at **5 percent** per annum.

* * *

The Exchange Value rose to $17.25, reflecting some firming in the market for natural uranium concentrates. There was relatively little activity in March, but subtle changes in the market became apparent towards the end of the month. Two factors were principally responsible for the rise in the Exchange Value.

1. One large block of lower-priced U_3O_8 was withdrawn from the market.

2. Although overall active spot and near-term demand remained relatively thin, one new block of demand recently appeared.

Uranium sellers generally offered material at higher price levels than were offered last month, and though buyers failed to respond, the small rise in the Exchange Value reflects both the widening gap between sellers and buyers and the sense that higher prices will be needed to conclude new transactions. Demand levels are low for natural uranium concentrates; all of the transactions reported this month involved natural or enriched UF_6.

The UF_6 Value was unchanged, largely because there are still significant quantities of supply at the $48.00 level in the market, and several buyers are actively seeking material at that general price level. One such transaction involving a US utility was concluded during March. A number of utilities continue to solicit offers for longer-term deliveries, and several are expected to reach agreements for supply in the next few months.

* * *

The Conversion Value remained at $1.80 this month, as there was little activity in the secondary market for conversion services. No transactions are reported. Uncertainties regarding the shutdown of operations at Sequoyah Fuels' conversion facility, though still prevalent, failed to cause additional potential buyers of conversion services to enter the secondary market.

* * *

ENRICHED URANIUM AND SWUS

The **SWU Value** as of March 31, 1986, is $80 per SWU. This refers to SWU at a tails assay of 0.30 weight-percent U_{235} and for delivery within one year. Three secondary market SWU transactions are reported this month, involving approximately 100 thousand SWUs. Two of the transactions involved enriched uranium.

Most of the SWU available at present is priced near the $80 level, although both supply and demand are low. One seller, a US utility, appeared in the middle of the month and expressed an interest in liquidating a relatively large quantity of SWU in a short time. Offered at a lower price level, the inventory sold quickly, leaving only smaller blocks of SWU in the market. Without competition stemming from the presence of firm buyers, there was little downward pressure on those asking prices.

* * *

DOE recently informed its customers that as of the beginning of fiscal year 1987, the price ceiling under the Utility Services enrichment contract (USEC) will be reduced to $120 per SWU from the FY86 ceiling of about $134 per SWU. Thus, the FY87 USEC price structure consists of a base price of $119 per SWU and a ceiling price of $120 per SWU. The new ceiling price is subject to the same escalation factor as was the previous ceiling, incorporating the US GNP Implicit Price Deflator. The reduced ceiling probably will not have a significant effect on most of DOE's utility customers; they will benefit chiefly from the reduced *base* price.

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CURRENT MARKET DATA

March 31, 1986	Market Values	Active Supply[1] (thousands)	Active Demand[1] (thousands)
EXCHANGE VALUE	**$17.25**/lb. U_3O_8	2,525	950
UF_6 VALUE	**$48.00**/kgU		
CONVERSION VALUE	**$1.80**/lb. U as UF_6	975	950
SWU VALUE 0.3 tails assay; delivery within one year	**$80**/SWU		
LOAN RATE	5%/annum	0	0

	$/lb. U_3O_8	Millions of Pounds	Number of Transactions	Number of Months
TRANSACTION VALUE	**16.70**	2.7	18	6

[1]Supply and demand tables in *Current Market Data* section of this Report detail the numbers for each category.

DEFINITIONS

1. The **Exchange Value** is Nuexco's judgment of the price at which transactions for significant quantities of natural uranium concentrates could be concluded as of the date indicated.
2. The **UF_6 Value** is Nuexco's judgment of the price at which spot and near-term transactions for significant quantities of natural uranium hexafluoride could be concluded as of the date indicated.
3. The **Conversion Value** is Nuexco's judgment of the price at which spot and near-term transactions for significant quantities of conversion services could be concluded in the secondary market as of the date indicated.
4. The **SWU Value** represents Nuexco's judgment of the price at which transactions for the sale of significant quantities of SWUs of stated origin for delivery in the specified time period could be concluded as of the date indicated.
5. The **Loan Rate** is Nuexco's judgment of the annual interest rate at which uranium loans could be concluded as of the date indicated.
6. The **Transaction Value** is a weighted average price of recent natural uranium sales transactions. The calculation is based on prices paid in:
   a. Transactions closed within the previous three-month period for which delivery is scheduled within one year of the transaction date;
   b. At least ten transactions;
   c. Transactions involving a sum total of at least 2 million pounds U_3O_8 equivalent.

   The sample time is extended as necessary to include these minima. Other currencies are converted to US dollars using conversion rates in effect on or near the transaction date.

DERIVATIONS AND COMMENTS

1. All Market Values are based on:
   a. Data from recently completed transactions.
   b. Data from pending transactions.
   c. Firm bids to buy or borrow, and firm offers to sell or lend.
   d. Prices purchasers or rates borrowers have expressed a willingness to pay, but for which Nuexco is not aware of firm bids to buy or borrow, and prices sellers or rates lenders have expressed a willingness to accept, but for which Nuexco is not aware of firm offers to sell or lend.
2. Prices associated with deliveries under old or renegotiated contracts or other than arm's-length transactions are not included in the determination of these Market Values.
3. In the determination of the Conversion Value, Nuexco does not consider transportation charges other than those customarily provided by primary suppliers of conversion services.
4. The prices of conversion services or SWUs delivered under long-term contracts with primary suppliers are not considered in the determination of either the Conversion Value or SWU Value.
5. For the SWU Value, Nuexco converts SWU prices at varying tails and product assays to equivalent SWU prices at a tails assay of 0.30 weight-percent U_{235} and a product assay of 3.0 weight-percent U_{235}, assuming feed costs corresponding to the Nuexco Exchange and Conversion Values determined as of the same date.
6. In calculating the Transaction Value, Nuexco does not account for the price of uranium delivered in connection with contracts which call for "market price" mechanisms. This exclusion applies particularly to contracts in which delivery prices are expressed as a function of future Exchange Values or any other indeterminate variable. Also excluded from the calculation are any other transactions in which the delivery price is defined in such a way that it cannot currently be determined.

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CURRENT MARKET DATA

EXCHANGE VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	per lb. U_3O_8 in Concentrates			per kg. U in Concentrates		
	This Month (Mar 31, 1986)	Last Month (Feb 28, 1986)	12 Months Ago (Mar 31, 1985)	This Month (Mar 31, 1986)	Last Month (Feb 28, 1986)	12 Months Ago (Mar 31, 1985)
Australia (dollar)	24.20	23.97	21.28	62.92	62.31	47.11
Belgium (comm. franc)	823.00	771.68	940.44	2,140	2,006	2,353
Canada (dollar)	24.09	23.98	20.53	62.53	62.35	56.50
Finland (markka)	89.33	86.03	97.66	232.24	223.66	245.26
France (franc)	123.66	116.20	143.13	321.48	302.09	351.60
FRG (mark)	40.19	37.89	46.90	104.49	98.50	114.17
Italy (lira)	26,038	25,668	29,922	67,692	66,731	71,469
Japan (yen)	3,098	3,082	3,793	8,052	8,012	9,892
Netherlands (guilder)	45.53	42.67	52.80	118.36	110.93	128.78
South Africa (rand)	35.75	33.73	28.71	92.95	87.69	54.63
Spain (peseta)	2,510	2,380	2,610	6,525	6,187	6,547
Sweden (krona)	126.65	121.69	135.01	329.27	316.37	340.23
Switzerland (franc)	33.56	32.00	38.88	87.25	83.20	94.56
UK (pound)	11.68	11.58	12.20	30.36	30.11	30.43
US (dollar)	17.25	17.00	15.00	44.35	44.20	44.20

TRANSACTION VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	per lb. U_3O_8 in Concentrates			per kg. U in Concentrates		
	This Month (Mar 31, 1986)	Last Month (Feb 28, 1986)	12 Months Ago (Mar 31, 1985)	This Month (Mar 31, 1986)	Last Month (Feb 28, 1986)	12 Months Ago (Mar 31, 1985)
Australia (dollar)	23.43	23.54	21.35	60.91	61.21	53.34
Belgium (comm. franc)	796.76	758.06	943.57	2,071	1,971	2,665
Canada (dollar)	23.32	23.56	20.60	60.63	61.25	63.97
Finland (markka)	86.48	84.51	97.98	224.84	219.72	277.72
France (franc)	119.71	114.15	143.61	311.23	296.76	398.14
FRG (mark)	38.91	37.22	47.06	101.16	96.76	129.28
Italy (lira)	25,208	25,215	30,022	65,543	65,554	80,928
Japan (yen)	2,999	3,028	3,805	7,796	7,871	11,201
Netherlands (guilder)	44.08	41.92	52.97	114.59	108.98	145.82
South Africa (rand)	34.61	33.13	28.80	89.98	86.14	61.86
Spain (peseta)	2,430	2,338	2,619	6,317	6,078	7,413
Sweden (krona)	122.61	119.54	135.46	318.77	310.78	385.26
Switzerland (franc)	32.49	31.44	39.01	84.47	81.73	107.07
UK (pound)	11.31	11.38	12.24	29.39	29.58	34.46
US (dollar)	16.70	16.70	15.05	43.42	43.42	50.05

[1]Calculated using currency exchange rates published in the *Wall Street Journal* on March 31, 1986.

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CURRENT MARKET DATA

CONVERSION VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	per lb. U as UF_6			per kg. U as UF_6		
	This Month (Mar 31, 1986)	Last Month (Feb 28, 1986)	12 Months Ago (Mar 31, 1985)	This Month (Mar 31, 1986)	Last Month (Feb 28, 1986)	12 Months Ago (Mar 31, 1985)
Australia (dollar)	2.53	2.54	1.42	5.57	5.59	3.13
Belgium (comm. franc)	85.88	81.71	62.70	189.33	180.13	138.22
Canada (dollar)	2.51	2.54	1.37	5.54	5.60	3.02
Finland (markka)	9.32	9.11	6.51	20.55	20.08	14.35
France (franc)	12.90	12.30	9.54	28.45	27.12	21.04
FRG (mark)	4.19	4.01	3.13	9.25	8.84	6.89
Italy (lira)	2,717	2,718	1,995	5,990	5,992	4,398
Japan (yen)	323.22	326.32	252.84	712.57	719.42	557.43
Netherlands (guilder)	4.75	4.52	3.52	10.47	9.96	7.76
South Africa (rand)	3.73	3.57	1.91	8.22	7.87	4.22
Spain (peseta)	261.89	252.00	174.00	577.38	555.55	383.61
Sweden (krona)	13.22	12.88	9.00	29.14	28.41	19.84
Switzerland (franc)	3.50	3.39	2.59	7.72	7.47	5.71
UK (pound)	1.22	1.23	0.81	2.69	2.70	1.79
US (dollar)	1.80	1.80	1.00	3.97	3.97	2.20

SWU VALUE AND UF_6 VALUE EXPRESSED IN SELECTED PRODUCER & CONSUMER CURRENCIES[1]

Country (currency)	SWU VALUE delivery within one year (March 31, 1986)	UF_6 Value per kg.U in UF_6 This Month (March 31, 1986)	UF_6 Value per kg.U in UF_6 Last Month (February 28, 1986)
Australia (dollar)	112.23	67.34	67.67
Belgium (comm. franc)	3,817	2,290	2,179
Canada (dollar)	111.72	67.03	67.72
Finland (markka)	414.29	248.58	242.91
France (franc)	573.48	355.09	328.09
FRG (mark)	186.39	111.84	106.98
Italy (lira)	120,755	72,452	72,475
Japan (yen)	14,36.	8,619	8,702
Netherlands (guilder)	211.14	126.68	120.48
South Africa (rand)	165.80	99.48	95.24
Spain (peseta)	11,640	6,984	6,720
Sweden (krona)	587.37	352.42	343.59
Switzerland (franc)	155.64	93.39	90.36
UK (pound)	54.16	32.50	32.70
US (dollar)	80.00	48.00	48.00

[1]Calculated using currency exchange rates published in the *Wall Street Journal* on March 31, 1986.

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RECENT TRANSACTIONS[1]

Uranium Sales

Nuexco Transaction Number	Delivery Period	Approximate Quantity (thousands of pounds, U_3O_8 equivalent)	Approximate Price as Percent of Current Exchange or UF_6 Value	Seller	Buyer	Remarks
3698	1986	50-100	102	European Utility	R[5]	UF_6.
3697A	1986	50-100	indeterminate	European Utility	European Utility	Contained in enriched uranium.
3696	1987	101-300	100-101	R[5]	US Utility	UF_6.
3695	1986	less than 50	98	Canadian Producer	European Utility	UF_6.
3694A	1986	less than 50	96	Trader	European Utility	Contained in enriched uranium.

Enrichment Services
Secondary Market Sales

Nuexco Transaction Number	Delivery Period	Approximate Quantity[2] (thousands of SWUs)	Approximate Price[3] as Percent of Current SWU Value[4]	Seller	Buyer	SWU Origin	Remarks
3699	1986	50-100	94	US Utility	European Utility	DOE	
3697B	1986	less than 50	indeterminate	European Utility	European Utility	R[5]	Contained in enriched uranium.
3694B	1986	less than 50	88	Trader	European Utility	DOE	Contained in enriched uranium

[1]Transactions listed are not limited to those in which Nuexco was involved, but also include others of which Nuexco is aware.
[2]If tails assay is unknown or unspecified, Nuexco's calculation of SWU quantity assumes 0.20 w/o tails assay.
[3]Price is not normalized to 0.20% tails assay.
[4]Refers to SWU Value that corresponds to SWUs included in transaction. When prices and SWU values are expressed as discounts (e.g. X dollars less than DOE's USEC base price at time of delivery), the percentage refers to the ratio of the *discounts*, not the ratio of the prices.
[5]The notation *R* means that Nuexco either does not know, or that Nuexco has restricted that information to protect client confidentiality.

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CURRENT MARKET DATA

URANIUM SUPPLY
(March 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U_3O_8) Spot or Near-term[2]	Intermediate or Long-term	Remarks
Available for Sale:			
ACTIVE			
2335*	400	—	
2728	350	—	
2740	175	—	
2802	200	—	UF_6
2838*	50	—	UF_6
2919*	350	—	UF_6
2933*	250	250 per year	
3023	750	500	UF_6
2263		400 per year	1987 on
2625	—	500 per year	1987 on
2778	—	220 per year	1987-90
2781	—	100 per year	1988-95
TOTAL	2,525		
INACTIVE			
2336	250	250 per year	1986-94
2389	75	75 per year	1986-90
2703*	750	—	
2764	260	—	UF_6
2765	260	—	UF_6
2777	250	—	
2813*	15	—	
2851	125	—	
2853*	65	—	
2871*	50	—	
2297	—	200 per year	1986-89
TOTAL:	2,100		

*New or revised since last month.
[1]Measured from the date of this Report.
[2]For delivery within one year. This category excludes material deliverable within one year under other than spot or near-term contracts.
Projects removed since last month: 2793.

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URANIUM DEMAND
(March 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U_3O_8) Spot or Near-term[2]	Intermediate or long-term	Remarks
Inquiries to Purchase:			
ACTIVE			
2743*	200	—	UF_6
2806*	500	—	
2930*	250	—	UF_6
2217	—	1,000 per year	1989-95
2507	—	600	1987-89
2586	—	250 per year	1988-95
2681	—	500 per year	UF_6 or U_3O_8; 1987-88
2738	—	1,000	1989 on
2760	—	750 per year	1986-90
2770	—	500 per year	1988-94
2782*	—	900	1988
2808	—	300	1987 on
2821	—	120 per year	1988-93
2850	—	300 per year	1990-95
2870	—	100	1989
TOTAL:	950		
INACTIVE			
2548	290	—	
2733	500	500 per year	1987-95
2784	100	—	
2786*	65	—	
2798	70	—	
TOTAL:	1,025		

*New or revised since last month.
[1]Measured from the date of this Report.
[2]For delivery within one year. This category excludes material deliverable within one year under other than spot or near-term contracts.
Projects removed since last month: 2739, 2811, 2820, 2888.

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CURRENT MARKET DATA

LOAN SUPPLY AND DEMAND
(March 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U_3O_8) Within 1 Year	Beyond 1 Year	Remarks
Available for Loan:			
INACTIVE			
1938	2,000	—	UF_6
2036	500	—	
2667	800	—	
2805	2,000	—	
TOTAL:	5,300		

*New or revised since last month.
[1]Measured from the date of this Report.
Projects removed since last month: None.

No inquiries to borrow are reported this month.

CONVERSION SUPPLY AND DEMAND
(March 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of Pounds U as UF_6) Within 3 Years	Beyond 3 Years	Remarks
Available for Sale:			
ACTIVE			
2717*	175	—	
2849	300	900	1986-90
2874*	500	—	
TOTAL:	975		
Inquiries to Purchase:			
ACTIVE			
2833	400	—	
2865	450	—	
TOTAL:	950		
INACTIVE			
2882	—	1,000	1987
TOTAL:	0		

*New or revised since last month.
[1]Measured from the date of this Report.
Projects removed since last month: 2864.

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SWU SUPPLY AND DEMAND
(March 31, 1986)

Nuexco Project Number	Delivery Period[1] (Thousands of SWUs) Spot or Near-term[2]	Intermediate or Long-term	Remarks
Available for Sale:			
ACTIVE			
2571	—	55	1987
2873	40	—	
2914*	50	—	
TOTAL:	90		
INACTIVE			
2410A	340	—	
TOTAL:	340		
Inquiries to Purchase:			
ACTIVE			
2844*	20	—	
3024	10	—	
TOTAL:	30		

*New or revised since last month.
[1]Measured from the date of this Report.
[2]For delivery within one year. This category excludes SWUs deliverable within one year under other than spot or near-term contracts.
Projects removed since last month: 2811, 2889.

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RAW MATERIALS

THE MOUNT TAYLOR PROJECT

Introduction

Following a year-long assessment program, Chevron Resources Company announced on March 14 that it plans to proceed with commercial production at its Mount Taylor uranium mine, located in the Grants Mineral Belt in New Mexico. The test program was begun in March 1985 to determine the economic viability of the project with a view to establishing long-term uranium production for world markets. The mine initially was developed by Gulf Minerals Resources Company over an eight-year period; Gulf produced almost two million pounds U_3O_8 before placing the mine on standby status in 1982 because of diminishing market opportunities. Chevron Corporation assumed ownership of the project when it acquired Gulf in 1984. Chevron plans to mine 600 tons of ore per day during 1986, and expects full production to yield about 1.5 million pounds U_3O_8 per year.

Chevron's assessment program included revised mining, engineering and processing procedures for the project, focusing on high-grade ore zones and mining lower tonnages than in the Gulf operation. The proposed target tonnage in the Gulf project was to be 4,000 tons per day. The primary obstacles for Chevron consisted of rehabilitating the existing workings of the mine and developing innovative mining methods to compensate for the mine environment, chiefly high temperatures throughout the mine caused by large volumes of hot formation water. Chevron maintained a mining rate of at least 500 tons per day of ore throughout the last quarter of the test period, and the average ore grade produced was in excess of 0.50 percent U_3O_8. In addition, development drifting into previously untested ore zones indicated the availability of sufficient high-grade tonnage to support long-term mining requirements.

The Mount Taylor uranium deposits represent a geologic reserve of over 120 million pounds U_3O_8, perhaps the largest block of uranium reserves presently available in the USA. The deposits extend along a northwest-southeast strike length of about six miles and lie at an average depth of about 3,350 feet below the surface (3,100 feet at the present mine location), and are considered to be the eastward extension of the Ambrosia Lake mineral trend, first discovered in the early-1950s and heavily mined since then. Figure 1 shows the location of the Mount Taylor mine in relation to the general ore trend from the Churchrock district to the west and the Marquez/L-Bar district to the east.

Exploration History

Uranium exploration and mine development in the Ambrosia Lake area of New Mexico progressed rapidly during the initial exploration rush of the early to mid-1950s. Exploration competition gained momentum with each discovery and by the early 1960s, discoveries at depths of 2,000 to 3,000 feet had been recorded along the main trend of mineralization to the northwest and southeast of Ambrosia Lake. Anaconda reportedly made one such discovery at a depth of about 3,100 feet in the west San Mateo area, thereby extending the trend potential another six to eight miles to the southeast. However, the revised uranium procurement program initiated April 1, 1962 by the US Atomic Energy Commission (AEC) lowered the buying price of uranium from $12.00 per pound U_3O_8 to $8.00 per pound, discouraging uranium exploration and development efforts.

Subsequently, many small exploration groups were driven out of the business; the larger, well-established companies survived and continued their exploration efforts at least on a limited basis. In general, the industry remained reluctant to undertake new exploration commitments until 1966, when the US government imposed an embargo on the enrichment of non-US uranium destined for use in domestic power plants. The embargo assured additional domestic uranium requirements for US utilities, and created the incentive for deeper and more costly exploration programs.

One such program was initiated by Keradamex Inc., a joint venture of Noranda Mines Ltd. and Kerr Addison Ltd. Keradamex acquired leases on the Fernandez Ranch properties in 1968 and made several important discoveries in the vicinity of the ranch headquarters and east toward the village of San Mateo. Amerada Hess Corporation and Keradamex formed the Fernandez Joint Venture (FJV) later that year. Through 1970, the joint exploration effort resulted in the discovery and partial delineation of several large ore deposits along the trend which now makes up a large portion of the Mount Taylor uranium reserves.

Bokum Corporation staked mining claims to the southeast of the FJV discoveries and began drilling in early 1970. The Bokum drilling encountered high-grade uranium at a depth of about 4,000 feet, the deepest discovery at the time. Bokum and the FJV resolved a title dispute on the claims by entering into a equal-share joint venture. Eventually, the Bokum discovery was tied to the FJV discoveries through additional drilling, and the identified ore trend extended six miles across the Mount Taylor properties.

Gulf Mineral Resources Company began uranium exploration in the Grants Mineral Belt about 1968. The company recorded discoveries in the Mariano Lake and West Largo areas in 1969. Gulf developed an underground mine on the Mariano Lake deposit and continued mining operations, finally closing the mine in mid-1982. The West Largo deposit was later traded to Santa Fe Mining Company for a lease at Mount Taylor. In early

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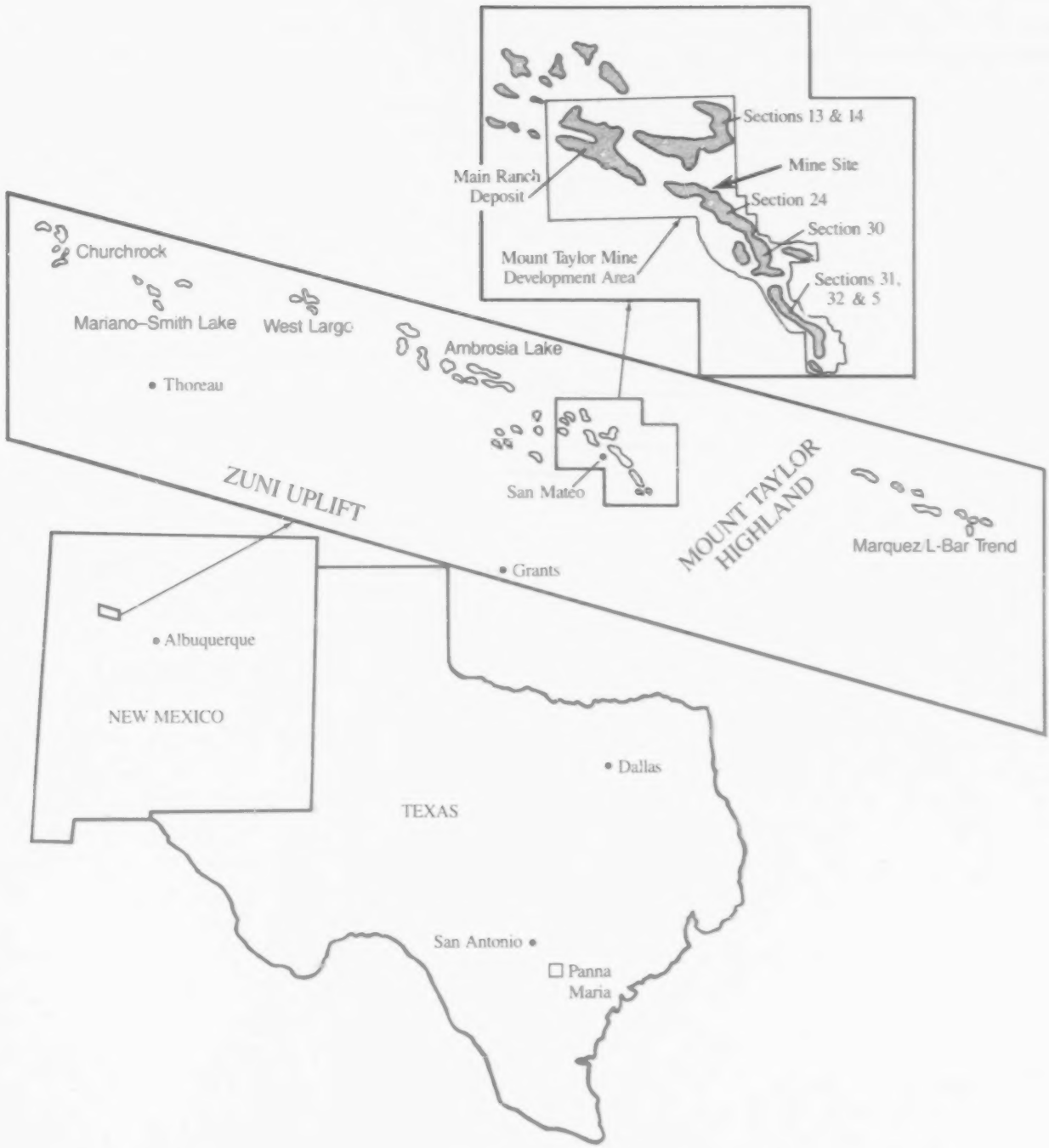

Figure 1. Location map of Mount Taylor mine project. Middle inset shows location of the project within the Grants Uranium Belt, and upper inset illustrates the Mount Taylor development area.

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1971 Gulf took its first position in the Mount Taylor project through the acquisition of the Amerada Hess interest in the FJV. Gulf's title position was 49 percent interest in the FJV and 24.5 percent interest in the Bokum claim block. However, by June 1971 Gulf had acquired full interest in the claims by acquiring Bokum's 50 percent interest and Keradamex's 24.5 percent interest. Gulf immediately accelerated exploration and development drilling on the properties, completing over 200 holes for a total of almost 590,000 feet drilled by the end of 1975. (To date, 689 holes have been drilled by all participants since 1968, totaling 2,164,360 feet.) Gulf's accelerated program included the drilling of a mine shaft pilot hole located in Section 24 in late 1971. The hole was core drilled to a depth of about 3,300 feet to obtain the geologic information needed to conduct preliminary engineering studies.

In order to gain full interest in the Mount Taylor ore deposits, Gulf made some land trades. In 1974 Gulf made a trade with Conoco, forfeiting one block of claims situated north of the main ore trend in exchange for three claims strategically located to assure uninterrupted mining access to 2.5 miles of ore continuing to the southeast. Additional trades in 1977 and 1979 completed the land transactions, leaving Gulf with full ownership except for royalties due on certain lands, including claims and Santa Fe Railroad leases.

By the end of 1977, the Mount Taylor ore trend was well delineated, extending west to east from the Main Ranch deposit at a depth of 3,000 feet to the claim block in Section 5 at a depth of 4,000 feet. The varying drill depth required to reach the ore is primarily due to topographic changes along the foothills of Mount Taylor; the mineralized horizon generally follows the gradual dip of 5 degrees or less to the southeast along trend. The inset in Figure 1 shows the location and configuration of the uranium trend as it is known to occur within the Mount Taylor mine development area.

Ore Deposits and Geology

Commercial ore deposits throughout the Grants Mineral Belt generally have formed as tabular bodies of irregular lateral extent, thickness and uranium content. The important deposits in the Morrison Formation vary widely in size from small pods with little or no commercial value to large ore masses several thousand feet long, several hundred feet wide, and tens of feet thick. The deposits usually form in clusters elongated in the direction of paleostream sedimentation, primarily in two of six designated sandstone units in the Westwater Canyon Member of the Morrison Formation. Ore occurs in two types of deposits in the Grants Mineral Belt: trend or primary ore, and redistributed ore. Deposits may consist of either or both types.

The Mount Taylor ore trend is a continuation of the Ambrosia Lake trend. Characteristics of sedimentation and mineral occurrence essentially are the same; however, one significant difference is the depth relationship. The deeper ores at Mount Taylor are totally unoxidized and preserved in trend-type deposits. Redistributed-type ore has not yet been identified at Mount Taylor.

The mineral suite is essentially the same as in neighboring regions, consisting of extremely fine-grained minerals identifiable only by X-ray analysis. Coffenite (uranium silicate) is the main uranium mineral present, but uraninite (uranium oxide) is a common companion mineral. Pyrite is abundant in portions of both areas. Molybdenum is scarce in Ambrosia Lake, but somewhat common at Mount Taylor, occurring primarily along the downdip or leading edge of an ore zone and containing characteristics common to geochemical fronts. Carbonaceous material is one of the most common gangue minerals present in both districts. It is usually closely associated with uranium mineralization, but at Mount Taylor it is extremely fine-grained and is less evident throughout certain ore horizons. The accumulation of mineralization is associated with changes in sedimentation patterns such as abrupt sand-silt-mudstone facies changes, cross-bedding and local disconformities. Rock permeability at Mount Taylor undoubtedly controlled solution flow and associated ore deposition along the geochemical fronts exhibiting typical roll front characteristics.

Geologists consider the source of uranium and associated minerals throughout the Grants Mineral Belt to be uranium-bearing volcanic materials, primarily thick tuffaceous accumulations. Uranium taken into solution by migrating groundwater was eventually precipitated in favorable host sediments at the geochemical interface between an oxidizing and reducing environment. The carbonaceous material served as the reductant in that environment.

The following economic relationship of mineralization to the six sand units making up the Westwater Canyon Member exists at Mount Taylor: the "C" sand contains the largest and highest-grade ore deposits, and the "B" sand is second in importance, containing a large reserve at the south end of the property. Ore accumulations in the remaining four sands are small and low-grade by comparison, and are considered to have only limited economic potential. Figure 2 is a stratigraphic section of the Westwater Canyon Member showing the relationship of uranium potential to each sand unit.

There are three major deposits in the "C" sand and one in the "B" sand within the boundaries of the Mount Taylor mine development area. Each deposit is sinuous in all dimensions, and mineralization ranges from thin stringers to concentrations which are ten or more feet thick, tens of feet wide, and as much as several thousand feet long. Ore thickness may increase to as

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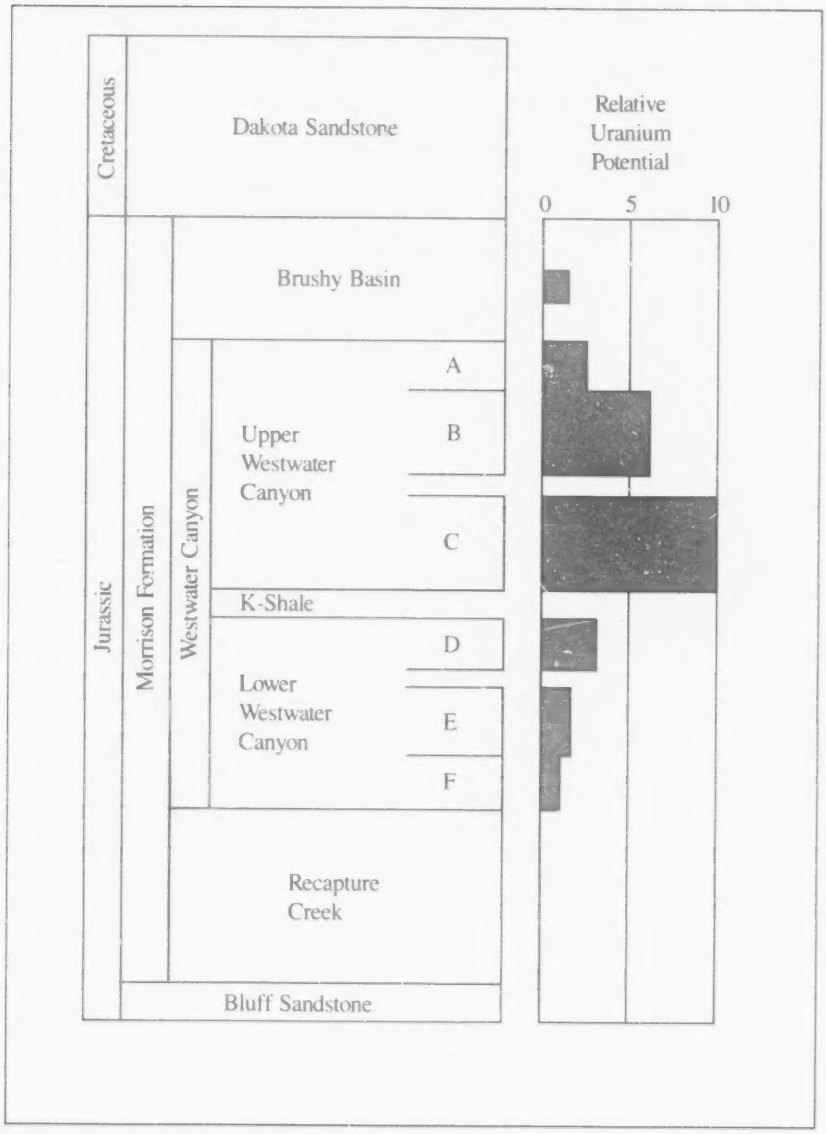

Figure 2. Stratigraphic section of the Morrison Formation, highlighting the six sandstone splits in Westwater Canyon. Bar on right shows the relative uranium potential of each formation member. (Adapted from SME paper by Mount Taylor Mine staff, October 1985.)

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much as 35 feet where two or more ore zones converge. That pattern is repeated many times throughout the overall ore trend, creating extensive areas of almost continuous ore (Figure 1).

Chevron estimates ore reserves along the trend to be approximately 121 million pounds U_3O_8 at an average grade of 0.25 percent U_3O_8, considering a cutoff thickness of six feet at a grade of 0.10 percent. Included in this reserve estimate is the presence of about 7.5 million pounds U_3O_8 at grades of 0.50 percent U_3O_8 or higher in the immediate vicinity of the present mine area.

Project Development

Gulf's final engineering studies and preparations for mine development at Mount Taylor began in late 1974. Two vertical access shafts were included in the mine development plan. The shafts, situated 400 feet apart, are 14 feet and 24 feet in diameter. Each shaft is concrete-lined from the surface to the bottom depth of 3,300 feet. Construction of the 14-foot shaft was started in June 1975 and completed in August 1979; construction of the 24-foot shaft was started in January 1976 and completed in December 1979. The total cost of both shafts was approximately $200 million. Figure 3 shows the 180.5-foot headframe over the 24-foot shaft and the hoist building.

The shaft sinking process proved to be a challenge to Gulf and the prime contractor, as they encountered a number of major groundwater aquifers from a depth of about 500 feet to the bottom of each shaft. A dewatering program was initiated around the shaft sites by drilling 22 holes to a depth of 3,200 feet. Ten holes penetrated the "K" shale separating the upper and lower Westwater Canyon Member; the remaining 12 holes bottomed in the upper Westwater Canyon sandstone. In addition, extensive grouting was required to overcome some of the water problems and to stabilize the ground.

The first grouting job was designed to reduce the water flow and stabilize the Point Lookout Sandstone at a depth of about 770 feet to 885 feet. The Point Lookout Sandstone is unconsolidated and fine-grained, resulting in a continuous flow of sand into the

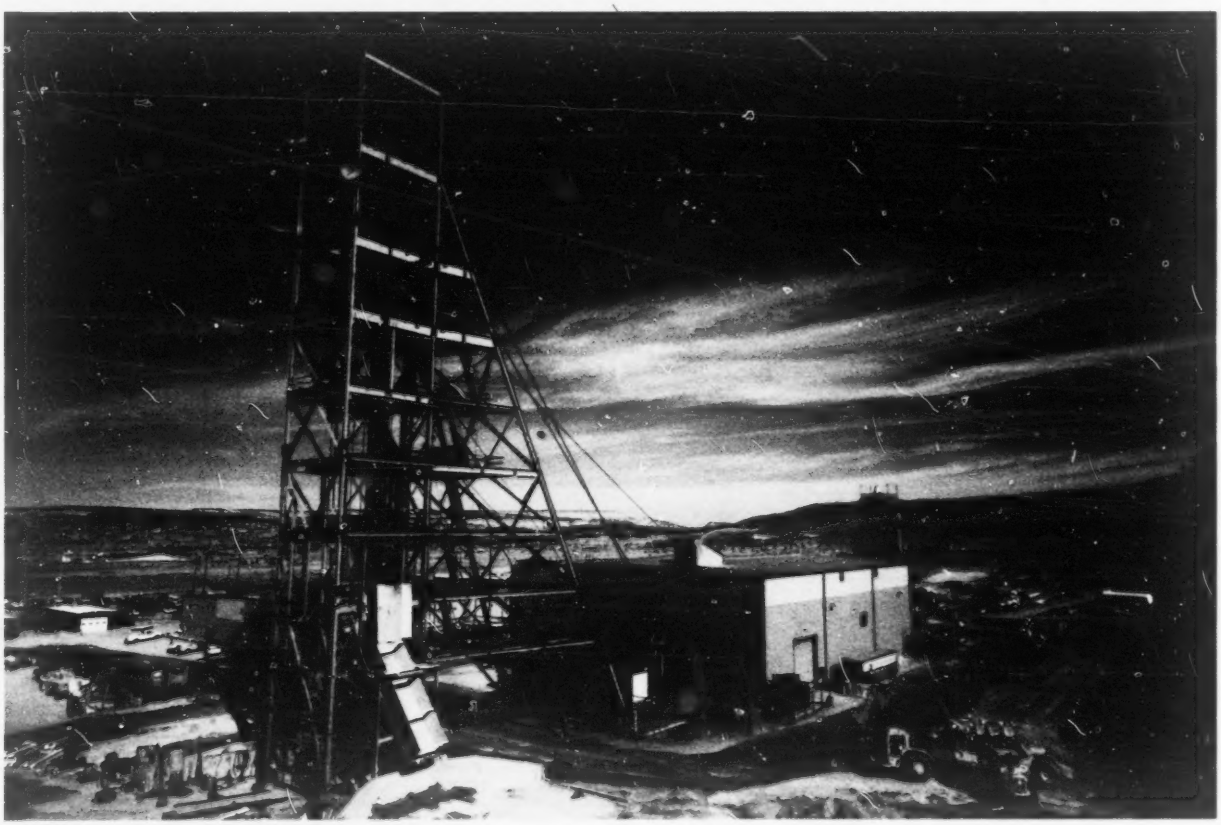

Figure 3. View of Mt. Taylor mine site looking northwest, showing the 180.5-foot headframe over the 24-foot shaft and the hoist building. The top of the headframe over the 14-foot shaft is visible over the far end of the building.

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shaft. To overcome this problem, a station was cut at the 700-foot level and a number of holes were drilled in fan patterns around the shaft and through the Point Lookout formation. Each hole was grouted from bottom to top using a chemical grout (Geoseal) under pressure. The project was largely unsuccessful; water flow was reduced minimally, and the extremely loose sand was only partially stabilized.

The same problem existed for the 24-foot shaft, but Gulf applied a different technique. First, a number of holes drilled in patterns around the shaft were allowed to flow to reduce the water pressure in the Point Lookout. Next, the shaft was sunk to the most unstable section of the Point Lookout, and 40 feet of liner plates (concave interlocking steel plates) were installed, followed by grouting behind the plates. This resulted in a sharp reduction of water flow into the shaft, and improved ground stabilization; shaft sinking continued through the Point Lookout. The same procedure was utilized to overcome the problem in the 14-foot shaft.

Although water and unstable ground problems persisted, shaft sinking advanced at a steady rate. Anticipating excessive problems in the Dakota Sandstone (at a depth of about 2,860 feet to 2,920 feet), Gulf completed pattern drilling from the pump station at the 2,600-foot level. The Dakota Sandstone was depressurized and grouted. Ground stabilization was sufficient to allow both shafts to advance through the Dakota Sandstone without serious incident or long delays. Final grouting stabilized the upper Westwater Canyon formation. Dewatering and grouting holes were drilled to a depth of 700 feet from the 2,600 level to accomplish this task. Shaft sinking continued to the final depths of 3,300 feet without serious problems.

Excessive heat plagued mine development almost from the beginning. The temperature of the groundwater increased substantially as the two shafts advanced. Water temperature in the Point Lookout was about 80 degrees Fahrenheit. It rose to 128 degrees from a depth of 2,600 feet to the bottom depth of 3,300 feet. The water temperature remains at 128 degrees Fahrenheit throughout the entire mine area. Reducing the air temperature of the mine to create favorable working conditions is one of the primary operating functions.

The master mine plan included three main levels: the ore level at 3,100 feet, the haulage level at 3,200 feet, and the sump level at 3,300 feet. The shafts were connected at each level as sinking advanced, primarily to improve ventilation and water removal in order to reduce the temperature. After the shaft connections were made, an ore development plan was initiated on the 3,100 level; ore collection, haulage and loading facilities were installed on the 3,200 level, and the 3,300 level became the mine sump for handling all drainage water. It was mid-1980 before all construction work was completed on each level.

The 14-foot shaft was used for movement of employees, materials and supplies. It also served as the fresh air intake for all mine ventilation. The 24-foot shaft was used exclusively for ore and waste hoisting and exhaust ventilation. Gulf had completed development work on the two lower levels and had mined about 250,000 tons of ore by the time the operation was placed on standby status in 1982. The mine was maintained on standby until Chevron began its assessment program in March 1985. Throughout the test program, Chevron employed 80 miners working three shifts in mining and new development, 40 persons in maintenance, and 40 staff members.

Surface facilities cover about 150 acres and include:

1. The hoist building which houses hoisting machinery for each shaft;
2. The mine office, change room, warehouse building, and maintenance shop;
3. Mine water discharge settling and treatment ponds;
4. Ore sampling and weighing building, ore stockpile area, and the waste rock storage area;
5. Support facilities, including the substation and emergency generators, compressors, the chill water plant, explosive magazines, fuel storage tanks, and mine supply yard.

Special Mining Considerations

Chevron's use of existing facilities closely follows the original project plan. The primary function of the 14-foot shaft is to move employees, materials, and supplies in and out of the mine, and it serves as the fresh air intake for all mine ventilation. The hoist is a single-drum unit, powered by a 1,300-horsepower (h.p.) electric motor. The functions of the 24-foot shaft are hoisting ore and serving as ventilation exhaust. It is also equipped with a large cage for movement of heavy mining equipment, such as the 10-ton locomotives used on the 3,200 level. Ore is hoisted in counter-balanced skips, each having a 12-ton capacity. The hoist is a double drum unit powered by two 1,250-h.p. motors.

The temperature of all working areas is reduced by removing the hot formation water as quickly as possible. A network of drain-ditches and piping allows water to drain by gravity or pipe transfer to settling sumps on the 3,300 level. (The sump and pumping system are designed to handle about 9,000 gallons of water per minute.) The water is then pumped to the 3,200 level with 200-h.p. horizontal pumps, where it is picked up by a bank of 500-h.p. pumps for lift to the surface. The water reaches the surface in two stages, assisted by additional pumps on the 2,600 level and the 1,600 level. At present, the pump rate to the surface averages 4,000 gallons per minute.

On the surface, the water is pumped to six holding ponds to allow settling of contained solid matter. The addition of barium chloride adjusts the pH, and an ion exchange plant is available for

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the removal of radium 226, but to date it has not operated. The water is allowed to cool to about 85 degrees F before it is pumped via a 24-inch pipeline a distance of 4.5 miles for discharge into a dry stream bed.

Maintaining proper mine ventilation is an important prerequisite to successful operations at Mount Taylor. The ventilation system now in use keeps mine temperature at a reasonable level and allows for a favorable working environment at each work station. A large volume of fresh air is required at all times to reduce the temperature and eliminate radon gas and diesel fumes emitted from mining equipment. Approximately 400,000 cubic feet per minute of fresh air is forced down the 14-foot shaft to the 3,200 level. The largest volume of fresh air entering the 3,200 level is forced along the network of haulage ways and up access raises into the working stopes on the 3,100 level. Auxiliary fans move the air directly to each mining face. Air is discharged from the stopes via a return network directly into the main exhaust system.

Mechanically cooled air is made available for exceptionally hot faces. This is accomplished by passing chilled water through portable heat exchange units positioned in the fresh air supply line. The unit, called a "chiller," is located near the working stope. Using a chiller can reduce the temperature about 15 degrees. Water for the chiller is cooled to about 45 degrees on the surface and piped underground; it is also used as drill water.

Stope Development

The mining process at Mount Taylor involves three separate but interrelated activities: track haulage and hoisting activities on the 3,200 level; rotary longhole drilling on both the 3,100 and 3,200 levels; and stope development and mining on the 3,100 level. The track haulage drifts, which measure 10 feet by 10 feet, accommodate mine development on the 3,100 level, passing directly under strategic locations where raise connections allow the passage of ore to the haulage level. The haulage drifts serve a number of other mining functions, such as passage of utilities (power cables, drill water and compressed air pipelines), the distribution of fresh air by special raises (separate from ore passes), and the transport of all mined ore to the hoisting shaft.

Tramming equipment consists of 10-ton diesel locomotives, pulling a string of 7-ton capacity ore cars which are loaded at the ore chutes originating on the 3,100 level (see Figure 4). A loaded train is trammed to the hoisting facilities where each car is probed to determine the grade of ore before it is dumped either into the high-grade or low-grade section of the loading trench. (High-grade ore is 0.350 percent or higher, and is dumped in the front section; low-grade ore is 0.150 percent to 0.349 percent, and is dumped in the back section; waste is dumped into the opposite side of the trench.) Ore is loaded according to grade into 12-ton skips and hauled to the surface.

Longhole drilling has been utilized to delineate uranium mineralization and to drain formation water from areas designated for development. Originally, Gulf drilled about 500 longholes from all three levels, principally to drain and stabilize the ground throughout the mine. Chevron has concentrated longhole drilling from the 3,200 level. The holes are drilled in fan patterns, from an almost vertical position to about 15 degrees above horizontal. Several fans are drilled from the same station, to a maximum depth of 200 feet. Each hole is probed for radiometric determination of ore intervals and uranium content. Each hole is also surveyed with in-the-hole instruments for accurate orientation and plotting of information about ore. The holes are cased with two-inch plastic pipe. Collars of holes are piped into a manifold for the collection of water to minimize heat from the hot water (see Figure 5). Chevron drilled about 90,000 feet of longhole during the test period.

A stope plan of an ore block is determined on the basis of longhole drilling results and previous mining. Once the geometry of the block is established, miners drift through the block to divide it into sections, or pillars measuring approximately 70 feet

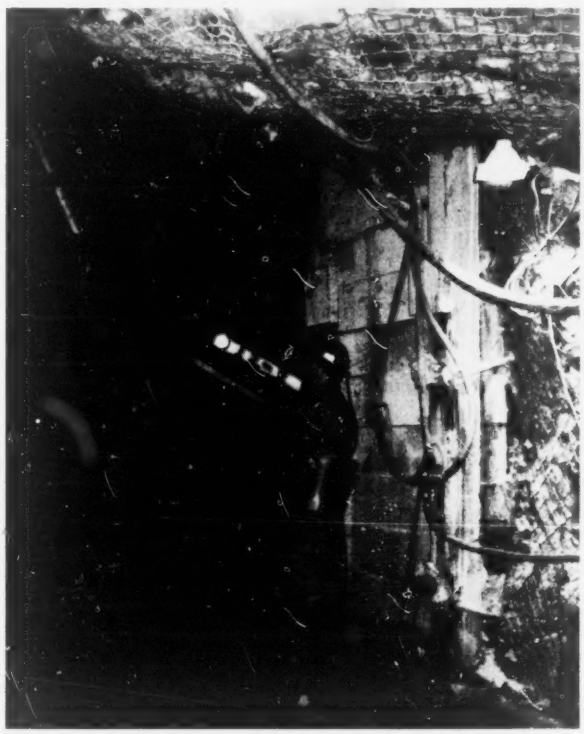

Figure 4. An ore loading chute on the haulage level. When train car is in position, hydraulic ram (upper left) opens and closes chute gate, loading the car.

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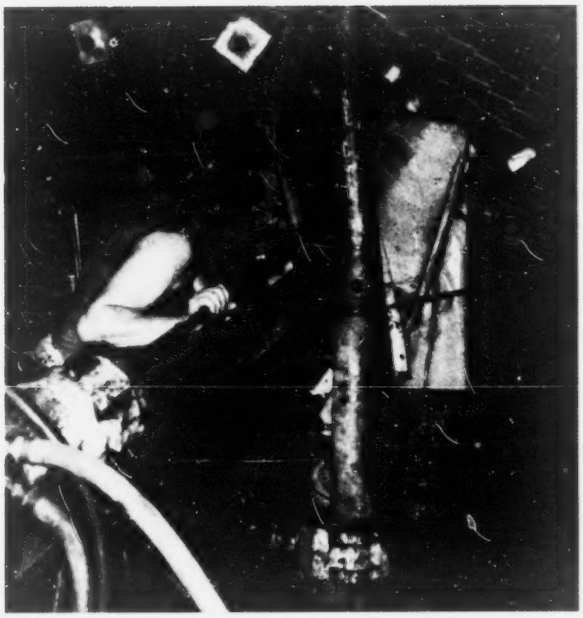

Figure 5. Longhole drilling operation using a Watson 750 Rotary Longhole Machine. Two completed holes are shown on upper right; squares at upper left are roofbolt plates. Left side of face remains to be drilled.

by 100 feet. Development drifts follow the bottom elevation of ore to minimize waste removal. The drifts are seven feet high and ten feet wide to accommodate the use of two-yard, diesel-powered load-haul-dump units (LHD) for travel over the undulating and often muddy tunnels. Mining with LHDs is the most efficient method because of the volume of material that can be moved with minimum equipment and manpower.

Pillar extraction is the final mining phase of any one ore block. Each pillar is gradually subdivided into smaller pillars in a pattern that permits efficient ore removal. During final retreat, the use of temporary ground support (timber stulls) is often required to recover the last ore. The mined-out area is then allowed to cave to the last line of pillars, which remain to protect the main access drifts.

Grade control is an important phase of the mining process. An estimate of the U_3O_8 content in the ore is maintained at strategic locations during the mining process. The estimates begin with the mapping of ribs and face, followed by drilling and probing a six-foot hole in the floor and back prior to each blast. Next, the broken ore is probed at the face. It is probed a second time in the train car prior to dumping in the hoisting trench. When it is hoisted to the surface, it is dumped into a 25-ton truck; each truckload is scanned and sampled (Figure 6). Finally, the loaded truck is dumped at one of six stockpiles according to grade determination. Ore stockpiles are separated according to the estimated U_3O_8 content. The various stockpiles facilitate better blending control to achieve maximum uranium recovery:

a. High-grade = 0.50 percent and higher;
b. Ore-grade = 0.35 percent to 0.49 percent;
c. Sub-ore = 0.15 percent to 0.34 percent;
d. Mineralized = 0.10 percent to 0.14 percent;
e. Low-grade = 0.03 percent to 0.09 percent;
f. Waste rock = less than 0.03 percent.

Ore Processing

Chevron has not announced where or how the ore from Mount Taylor will be processed. The company determined that the ore is amenable to recovery by conventional acid-leach and solvent extraction. Thus, Chevron has several options available, including processing ore at one of the local mills presently on standby status, building a new facility, or transporting the ore 960 miles to Chevron's acid mill at the Panna Maria site near Hobson, Texas (Figure 1). The first 60,000 tons mined by Chevron will be sent to Panna Maria for full metallurgical testing. The final ore processing strategy will be based on test results.

Acknowledgement

This article was made possible through the cooperation of Chevron Resources Company. Additional information is supported by articles in Memoir 15, Geology and Technology of the Grants Uranium Region, 1963. Specifically, the article *Mineralogy*, by H. C. Granger, pages 21-37, was useful in describing the uranium mineralogy of the region.

APPENDIX

Regional Geology

Uranium mineralization is known to occur in several different formations of Mesozoic age. The Westwater Canyon Member (middle member) of the Morrison Formation of Late Jurassic age is known to contain about 90 percent of the uranium in the Grants Mineral Belt. The Brushy Basin Member (upper member) contains about 8 percent in a thick sandstone lens near its upper contact with the Dakota Sandstone.* The older Todilto Limestone, which is also of Late Jurassic age, contains the remaining 2 to 3 percent.

*This references total uranium discovered (and mined) in the Grants Uranium Belt; significant amounts of uranium discovered in the Todilto Limestone and Jackpile Sandstone have been mined out.

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The Morrison Formation consists of three members containing fluvial conglomerate, sandstone, shale and mudstone units which cover a large portion of the Four-Corners region of the San Juan Basin. In the Grants Mineral Belt, the formation tends to grade from conglomeritic sandstones in the south and west to finer materials in the north and northeast. Thickness of the three members varies from about 300 feet to a maximum of 600 feet, but district average is closer to 450 feet. The depositional sequence of the Morrison is described in ascending order (Figure 2).

The Recapture Creek Member is in conformable contact with the underlying Bluff Sandstone. It averages about 100 feet in thickness and consists of green to purple variegated shale and mudstone with intercalated fine-grained sandstone and impure limestone units. Uranium mineralization of minor economic importance is known to occur as small pods and stringers in upper sandstone layers; the probable uranium source was downward migration from uranium in the overlying Westwater Canyon sands.

The Westwater Canyon Member overlies the Recapture in conformable contact. It consists of tan to dark gray, medium to coarse-grained arkosic sandstone with interbedded mudstone layers and lenses; thickness varies from about 70 feet to 200 feet. The depositional pattern indicates the build-up of meandering stream systems flowing to the northeast, east, and southeast throughout much of the Chaco Slope area. The channel system in the Ambrosia Lake district continues into the Mount Taylor district.

The Westwater Canyon Member is subdivided into two main sandstone units at the Mount Taylor mine. The sequence consists of the upper Westwater Canyon, subdivided into the A, B, and C sands, and the lower Westwater Canyon, subdivided into the D, E, and F sands. The six sands, which are separated by discontinuous shale and mudstone layers, average 30 feet in thickness, but commonly coalesce to a thickness of 60 feet. A continuous shale bed locally referred to as the "K" shale separates the C and D sands throughout the mine area. Shale thickness may vary from 1 to 40 feet. The "C" sandstone contains most of the uranium known to occur at Mount Taylor. The deposits are characteristically much larger and higher grade than in the other sands.

The Brushy Basin Member is 50 feet to 150 feet thick and

Figure 6. An ore truck parked under the scanning device. The worker is sampling the load for a rapid lab analysis. The load is dumped in the appropriate stockpile after the grade is determined.

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conformably overlies the Westwater Canyon Member. The contact is gradational and depositional overlapping is common. It generally consists of variegated green and red clay, mudstone and interbedded sandstones which compare lithologically with the upper Westwater Canyon sands. The basal sand unit is often mineralized and in some areas is identified as the Poison Canyon Sandstone, which was mined in the southeast part of the Ambrosia Lake district. Further to the east in the Laguna district, the upper sand unit in the Brushy Basin Member has been identified as the Jackpile Sandstone, which was the source of a large deposit mined by open-pit methods. The Brushy Basin Member is overlain by the Dakota Sandstone of Cretaceous age.

Local Geologic Structure

The uranium mineralization in the Grants Mineral Belt lies entirely within the southernmost portion of the San Juan Basin, a topographic depression included as part of the Colorado Plateau province. The local structural features are primarily related to the Zuni Uplift which forms the southern limit of the basin. Generally, the sediments dip 1 to 5 degrees northward off the Zuni highland, forming the Chaco Slope.

Major faulting is directly associated with the uplift, transecting the uranium belt in at least ten locations across the 100-mile length. The faulting strikes to the north and northeast, and in some cases extends well into the basin interior. The downdropped block is usually on the east side in the Ambrosia Lake and Mount Taylor districts, a likely influence of structural sagging into the Rio Grande Trough at the east end of the belt. Maximum fault displacement, as indicated by drilling, is about 600 feet. Numerous minor faults occur in close association with the major structures. A pattern of north-south folds, synclinal and anticlinal structures are common to the district. All structural features, including the Zuni Uplift, are Late Cretaceous to Early Tertiary in age; thus, structural activity is post ore in occurrence.

Structural changes are more pronounced in the Mount Taylor project area. The sediments dip about 5 degrees almost due east at the west end of the Main Ranch deposit, perhaps showing influence of the San Mateo anticline located 2 or 3 miles to the northwest. At the mine location, the sediments again dip 5 degrees to the north, increasing to approximately 20 degrees to the north at the southeast end of the property. Such an abrupt change probably reflects structural activity in close proximity to Mount Taylor volcanism during Pleiocene time.

Two major faults affect the Mount Taylor deposits. The San Rafael fault extends from the Zuni uplift, passes near the town of Grants, and continues northeast to displace the west end of the Main Ranch ore deposit. Displacement of the ore zone is 500 to 600 feet down to the east. The Lagunita fault displaces the ore deposit at the southeast end of the project area. Displacement is about 80 feet down to the east. A number of smaller faults occur in between. Displacement varies from a few feet to as much as 30 feet, none of which is expected to pose serious mining problems.

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RECENT DEVELOPMENTS

AUSTRALIA

The validity of an amendment to the Atomic Energy Act to approve the operation of Energy Resources of Australia's (ERA) Ranger mine has been challenged by the Northern Land Council (NLC). The NLC, an Aboriginal body, initiated the complex legal action against the Australian Government and ERA, alleging that it was forced into signing the agreement by which the Ranger mine was approved. It is seeking to have the agreement set aside. In a hearing scheduled for April 9, the Australian High Court will address the constitutional challenge of the amendment's validity.

The amendment, enacted in 1980, provided that ERA could carry on operations at Ranger as if done on behalf of and authorized by the Australian government. If the High Court finds that the amendment is valid, it then must determine whether the amendment specifically authorizes ERA to conduct mining operations even if no enforceable agreement exists with the NLC. An affirmative Court ruling on both questions would end the litigation. If the Court rules in favor of the NLC on either of these points, the legal action could continue for an extended time.

* * *

ERA announced the financial results of its operations in the second half of 1985, ending December 31, 1985. Its profits declined 15 percent in the six month period, from US$20.4 million in the last six months of 1984 to US$17.9 million in the second half of 1985. In the past four years, a significant part of ERA's Ranger profits stemmed from lucrative contracts with European and Japanese utilities. Recently, however, uranium market realities have begun to affect ERA.

During Ranger's start-up phase, utilities paid up to US$38 per pound U_3O_8. Under the agreed pricing formula, the price for the first year was fixed. For the second and third years it was subject to escalation according to Australian government labor and materials price indices. Only in the fourth year was the contract price set by reference to the international market price, subject to the Australian floor price. Although at present export prices may not be lower than the government floor price, any change in or reinterpretation of the floor price policy could put further pressure on ERA's future revenue and profitability.

CANADA

Eldorado Resources Limited has announced increased uranium reserve estimates at two projects at Eagle Point, 12 kilometers north of its Rabbit Lake mill in Saskatchewan (Figure 7). As a result of drilling during 1985, the reserve estimate at the Eagle North deposit has been increased to 20,000 metric tons uranium (MTU) (52 million pounds U_3O_8) at an average grade of 2.6 percent U_3O_8. The geologic reserve estimate was based on a cutoff grade of 0.50 percent U_3O_8. The Eagle North project is a joint venture owned by Eldorado Resources, Noranda Exploration, and Saskatchewan Mining Development Corporation (SMDC); each company owns one-third of the project.

At the Eagle South deposit, wholly owned by Eldorado Resources and immediately adjacent to Eagle North, estimated geologic reserves were increased from 13,000 MTU to more than 30,000 MTU (78 million pounds U_3O_8).

The Eagle Point deposits were discovered in 1980 by Gulf Minerals, and Eldorado Resources acquired the property in 1982. According to Eldorado, the ore at Eagle Point features high-grade and simple mineralogy in stable host rock, indicating that conventional mining methods will probably be feasible. Further exploration and definition drilling is in progress at both deposits, utilizing a total of seven drilling rigs. Eldorado has indicated that the development of the Eagle Point deposits will ensure sufficient reserves to feed the Rabbit Lake mill into the next century.

JAPAN

Kansai Electric Power Company and six other Japanese utilities recently concluded their annual price negotiations for deliveries under long-term uranium supply contracts with South Africa's Nuclear Fuels Corporation (NUFCOR). The utilities agreed to pay approximately US$30.50 per pound U_3O_8 for fiscal year 1987 deliveries (ending March 31, 1987). This represents a reduction of about $2.00 per pound from the price paid for FY86 deliveries.

The annual price negotiations are primarily influenced by developments in the spot and near-term prices over the entire previous year, as opposed to the few months before the negotia-

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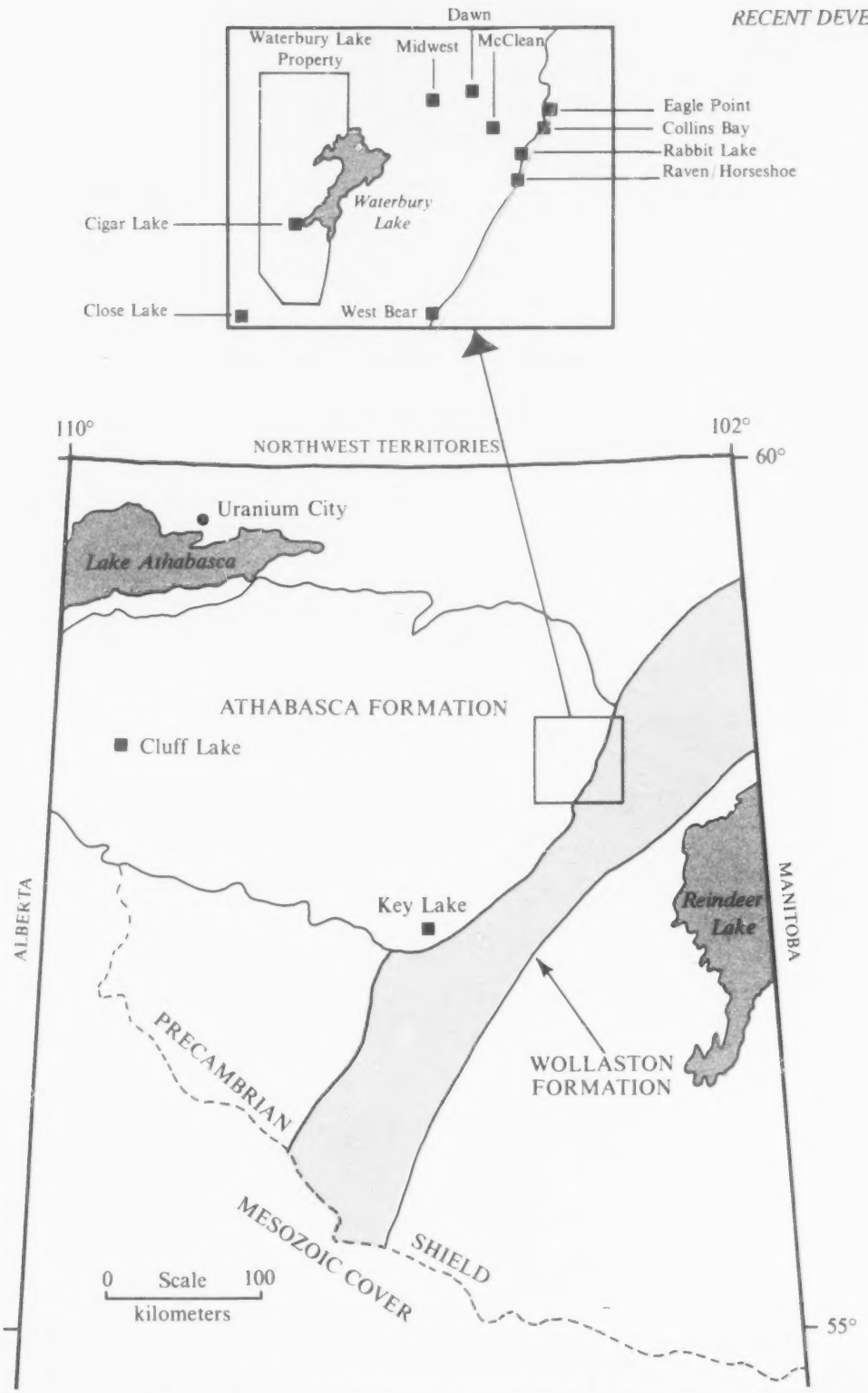

Figure 7. Location map of northern Saskatchewan, showing the Eagle Point uranium deposit and others in the district.

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tions. Thus, the weak market conditions prevailing during the first half of 1985 which led to a $14.25 Exchange Value in April probably had as much influence on the negotiations as did the steady strengthening of the market during the last six months of 1985.

The $2.00 drop for FY87 is particularly significant when compared with the total decline of only $3.00 under the delivery contracts from FY83 to FY86. While the low market prices prevalent during the first half of 1985 undoubtedly affected the negotiations, weakening energy prices worldwide also had an influence to some degree. Table 1 shows a comparison for the past seven years of annually negotiated prices versus average Exchange Values, including a ratio of negotiated price to average Exchange Value. The increasing ratios demonstrate that, at least until the latest negotiations, Exchange Values had fallen at a much greater rate than had the negotiated prices.

Table 1

RESULTS OF ANNUAL JAPANESE URANIUM PRICE NEGOTIATIONS COMPARED TO EXCHANGE VALUE

Fiscal Year Ending March 31	Approximate Agreed Price ($/lb. U_3O_8)	Average E.V. for Preceding Japan FY ($/lb. U_3O_8)	Ratio of Delivery Price to Average E.V.
1981	45.00	41.17	1.1
1982	37.75	28.63	1.3
1983	35.50	23.65	1.5
1984	33.70	19.65	1.7
1985	33.50	22.10	1.5
1986	32.50	16.44	2.0
1987	30.50	15.94	1.9

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PRIMARY MARKET CONVERTERS — BRITISH NUCLEAR FUELS plc

Introduction

British Nuclear Fuels plc (BNFL) provides a variety of fuel cycle services and is one of the five primary market conversion suppliers in the world (Table 2). The company converts natural uranium concentrates to UF_6 at its plant in Springfields, Lancashire (Figure 8). In addition to UF_6 conversion, BNFL provides enrichment (through its majority ownership share in Urenco Limited's Capenhurst plant), UO_2 conversion, fuel fabrication, reprocessing, and waste management. These functions are administered by four divisions; Fuel Division, Enrichment Division, Reprocessing Operations, and Reprocessing Engineering Division, the latter responsible for the design and construction of plants employing new reprocessing technologies. The company also owns and operates the nation's first two commercial nuclear power plants, the four-unit Calder Hall Gas-cooled Reactor (GCR) station on the Sellafield site, and the four-unit Chapelcross GCR station in Dumfriesshire, Scotland.

BNFL was created as a private limited company in 1971 out of the former Production Group of the United Kingdom Atomic Energy Authority. Following a period of commercial expansion in the 1970s, BNFL became a public limited company in 1984, and all shares are now owned by the British government. Traditionally, the Central Electricity Generating Board (CEGB) and South of Scotland Electricity Board (SSEB) have been the company's largest customers, purchasing Magnox and Advanced Gas-cooled Reactor (AGR) fuel elements for some 38 operating reactors in the UK.

Concentrate Sampling

Natural uranium concentrates normally arrive by ship or rail at the Springfields site and undergo sampling procedures to determine purity, weights and assays. BNFL employs the auger sampling method, in which an auger pipe 45-millimeters in diameter is inserted the full depth of the drum and is discharged into a sample container. Samples are distributed to the parties involved, and the analysis results are final if both of the parties agree to within 0.3 percent. If the parties do not agree to within that tolerance, an independent analysis is initiated.

Conversion to UF_4

BNFL, like most converters, uses the wet conversion process (Figure 9). This begins with the dissolution of uranium concentrates in nitric acid to produce a slurry containing impure uranyl nitrate and undissolved impurities. A series of continuous mixer-settler extractors filters the impurities, and tributyl phosphate (TBP) in kerosene is used to extract the uranyl nitrate. Some of the impurities removed, such as boron and cadmium, have high neutron capture cross sections, and would inhibit reactivity. Other impurities form volatile fluorides, which can contaminate the UF_6 produced in later stages. The purified uranyl nitrate is then concentrated by evaporation.

BNFL uses fluidized-bed reactors to thermally decompose the uranyl nitrate liquor at temperatures of 300-350 degrees C., forming UO_3. The nitrous fumes are removed and piped to a nitric acid recovery plant. The UO_3 is converted to UF_4 using the rotary kiln process, which consists of three main sections:

1. The hydration of the UO_3;
2. The reduction of the hydrate to UO_2;
3. The hydrofluorination of the UO_2 to UF_4.

In the hydration process, dilute nitric acid and a wetting agent are added to UO_3 to produce a slurry. The slurry gradually is dried in the hydrator. In powder form, the UO_3 hydrate is fed into the reduction kiln, where it reacts with a counter-current flow of hydrogen to produce UO_2. Offgases are filtered and scrubbed.

Table 2

FREE WORLD CONVERTERS

Company	Plant Location	Production Capacity (MTU as UF_6 per year)
Allied Corporation	Metropolis, Illinois	12,700
Comurhex	Pierrelatte, France	12,500
BNFL[1]	Springfields, UK	9,500
Sequoyah Fuels	Gore, Oklahoma	9,100
Eldorado Resources Ltd.	Port Hope, Ontario, Canada	9,000[2]

[1]British Nuclear Fuels plc.
[2]An older conversion facility with a nameplate capacity of 4,500 MTU as UF_6 per year is not currently in service.

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FOCUS

Figure 8. Location map of BNFL sites in the United Kingdom.

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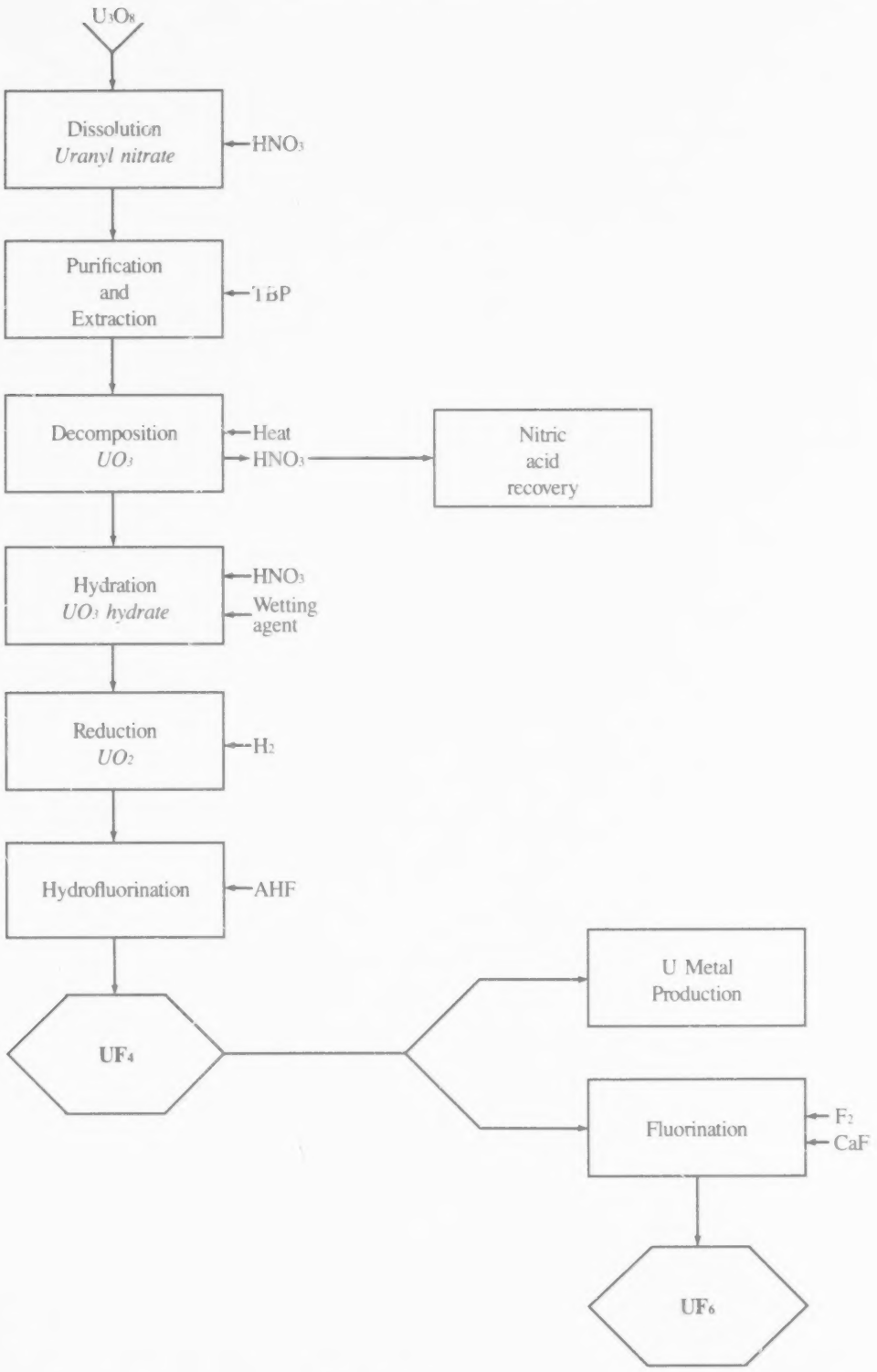
Figure 9. BNFL CONVERSION PROCESS

FOCUS



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The UO_2 product is then fed to hydrofluorination kiln. The UO_2 powder passes through five zones in the kiln, where it reacts with a counter-current flow of anhydrous hydrogen fluoride gas, producing UF_4. Forced air coolers maintain proper temperatures during the exothermic reaction. Offgases from the kiln are filtered, condensed and scrubbed. The UF_4 product is stored in preparation for transfer to the UF_6 conversion plant.

Part of the UF_4 output is reduced to uranium metal using magnesium. The uranium metal is used for replacement Magnox reactor fuel elements (Figure 10).

UF_6 Production

The reaction of UF_4 with elemental fluorine produces UF_6. BNFL currently utilizes two UF_6 production units; the first was commissioned in 1968 and has a capacity of 3,000 MTU annually, and a 6,500 MTU per year unit was commissioned in 1974. The units are operated from a single control room. Fluorine gas is produced by electrolysis of a fused salt at 85-90 degrees C.

The UF_4 reacts with fluorine gas in a fluidized bed reactor containing an inert bed of calcium fluoride granules. The reaction is highly exothermic, and the calcium fluoride prevents sintering of the UF_4 within the reactor. Forced-air cooling maintains the temperature of the fluidized bed at about 450 degrees C. The gaseous UF_6 product is filtered and passed through a series of condensers, where it cools to a solid. The condensers are reheated to liquify the UF_6, which is transferred to transit containers. BNFL owns a variety of transport cylinders to meet the requirements of UF_6 traffic worldwide.

Some of the UF_6 produced at Springfields is transported in 48-inch diameter cylinders to Urenco's Capenhurst enrichment facility. The remainder is shipped to the other enrichment plants worldwide, including Techsnabexport in the USSR.

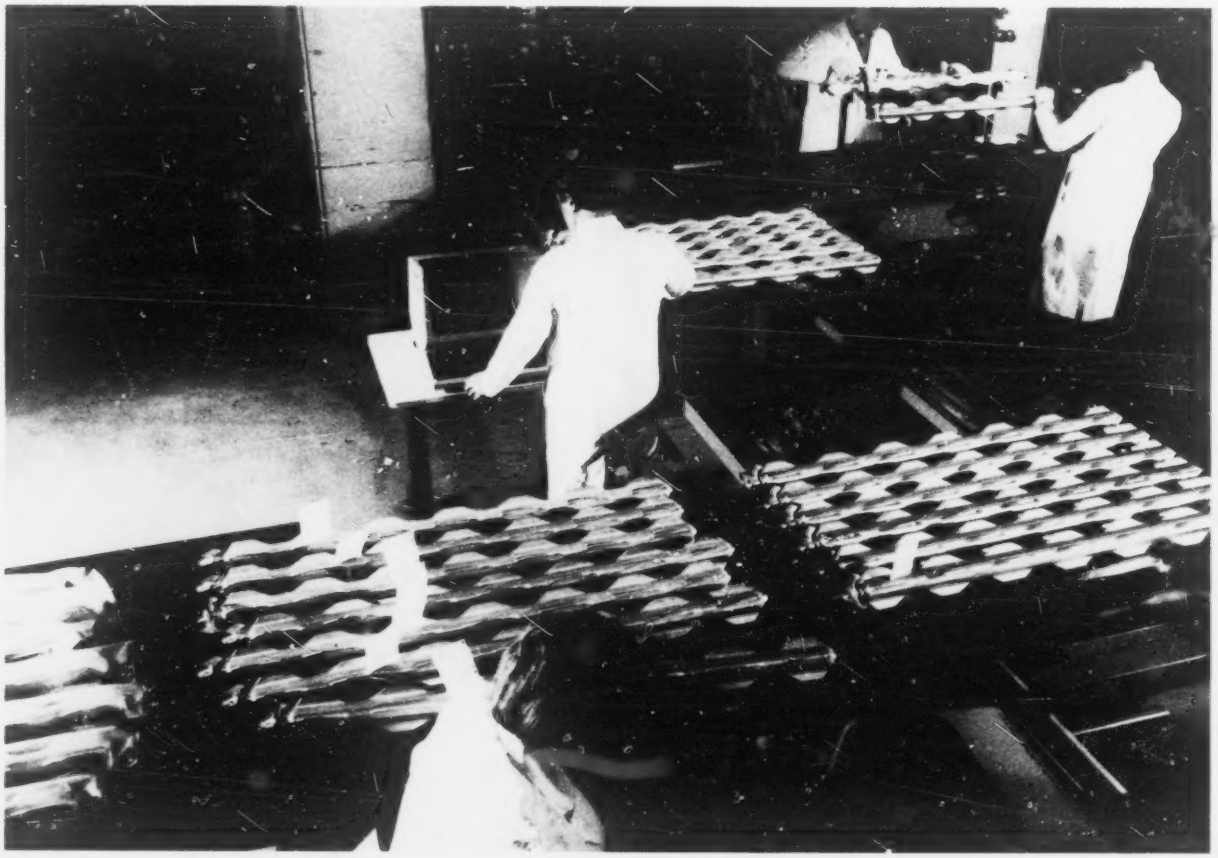

Figure 10. Final inspection of Magnox fuel elements at the Springfields facility.

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Marketing

Despite weakness in the conversion market worldwide, chiefly due to overcapacity, BNFL's wide range of services allows considerable flexibility. Current UF_6 production totals about 7,500 metric tons uranium annually. About 90 percent of its UF_6 production is destined for overseas end-users, primarily in Europe and the Far East. To date, only a few US utilities have contracted with BNFL for conversion services. This may in part be due to the fact that much of US utilities' uranium supply comes from North America and can be converted at one of the three North American converters.

During 1985, BNFL obtained new business in the USA, France, the Federal Republic of Germany, Spain, Italy and Japan for its entire scope of Fuel Division services. This business, totaling about 100 million pounds sterling (approximately US$145 million), included UF_6 production, fuel manufacturing and technology licensing. The Integrated Dry Route (IDR) process for the conversion of UF_6 to UO_2 powder was developed at Springfields and has been licensed to European and US fuel fabricators. In terms of total operations, including enrichment, reprocessing, and front-end fuel services, foreign orders accounted for about 23 percent of BNFL's total business in FY 1985. Most of this 23 percent was split between the Far East (11 percent) and Europe (10 percent); North and South America accounted for the remaining two percent of orders.

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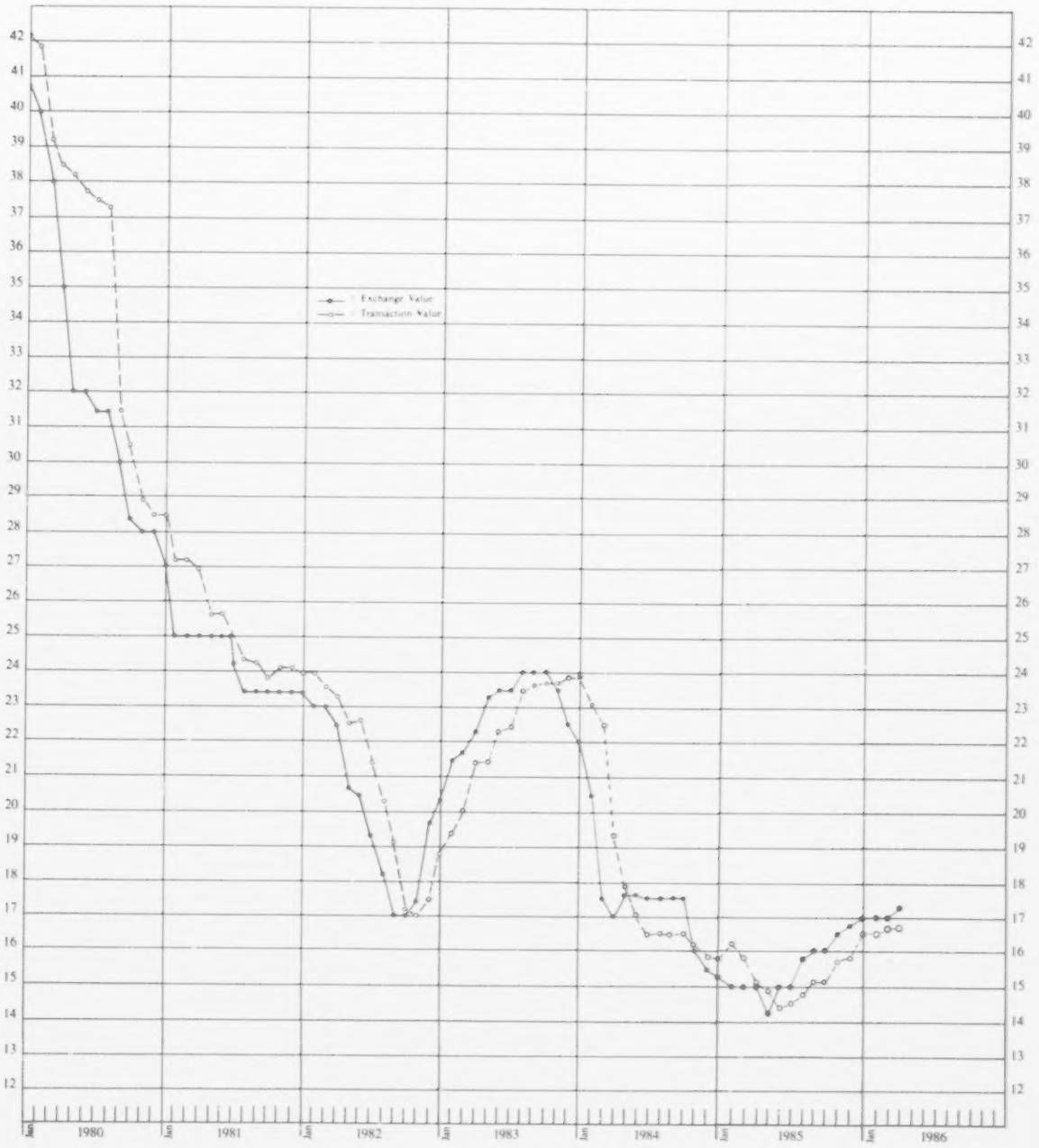
HISTORICAL MARKET DATA

EXCHANGE AND TRANSACTION VALUES
SINCE JANUARY 1980

Determined as of the last day of the month indicated



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HISTORICAL EXCHANGE VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1968	—	—	—	—	—	—	—	6.35	6.35	6.40	6.45	6.50
1969	—	6.35	6.10	6.10	6.25	6.25	6.20	6.20	6.15	6.15	6.15	6.20
1970	6.30	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.15	6.15	6.15	6.15
1971	6.20	6.20	6.20	6.20	6.15	6.05	6.00	5.95	5.95	5.95	5.95	5.95
1972	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95	5.95
1973	5.95	6.00	6.10	6.20	6.45	6.50	6.50	6.50	6.50	6.50	6.75	7.00
1974	7.70	7.90	8.00	9.00	9.50	10.50	11.50	12.00	12.50	14.00	14.75	15.00
1975	16.00	16.00	18.00	20.00	21.00	23.00	24.70	26.00	26.00	28.50	30.00	35.00
1976	32.50	37.00	39.25	40.00	40.00	40.00	40.00	40.40	41.00	41.00	41.50	41.00
1977	41.35	41.50	41.60	41.60	42.00	42.25	42.25	42.25	42.40	42.75	43.20	43.20
1978	42.90	43.25	43.25	43.25	43.40	43.40	43.40	43.10	43.25	43.00	43.25	43.25
1979	43.25	43.25	43.25	43.25	43.25	43.00	42.70	42.70	42.20	42.20	41.00	40.75
1980	40.00	38.00	35.00	32.00	32.00	31.50	31.50	30.00	28.50	28.00	28.00	27.00
1981	25.00	25.00	25.00	25.00	25.00	24.25	23.50	23.50	23.50	23.50	23.50	23.50
1982	23.00	23.00	22.50	20.75	20.50	19.25	18.25	17.00	17.00	17.50	19.75	20.25
1983	21.50	21.75	22.25	23.25	23.50	23.50	24.00	24.00	24.00	23.50	22.50	22.00
1984	20.50	17.50	17.00	17.75	17.75	17.50	17.50	17.50	17.50	16.00	15.50	15.25
1985	15.00	15.00	15.00	14.25	15.00	15.00	15.75	16.00	16.00	16.50	16.75	17.00
1986	17.00	17.00	**17.25**									

HISTORICAL TRANSACTION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U_3O_8)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1976	—	—	—	—	39.60	39.70	39.70	40.40	40.30	40.60	40.70	40.70
1977	41.30	41.30	41.40	41.50	42.80	42.90	43.00	42.60	42.50	42.80	42.90	42.90
1978	43.10	43.30	43.70	43.60	43.60	43.20	43.30	43.40	43.40	43.60	43.40	43.70
1979	43.60	43.80	43.70	43.40	43.60	43.70	43.70	43.60	43.60	43.60	43.50	42.30
1980	42.00	39.30	38.60	38.40	37.90	37.60	37.30	31.60	30.60	29.00	28.70	27.70
1981	27.20	27.20	27.00	25.70	25.70	24.50	24.40	24.30	23.90	24.10	24.10	24.00
1982	24.00	23.70	23.40	22.60	22.70	21.50	20.30	19.10	17.30	17.00	17.55	18.80
1983	19.35	20.00	21.35	21.40	22.35	22.45	23.50	23.60	23.65	23.65	23.85	23.85
1984	23.05	22.50	19.25	17.90	17.00	16.50	16.60	16.40	16.55	16.05	15.90	15.90
1985	16.20	15.70	15.05	14.90	14.45	14.60	14.75	15.10	15.10	15.75	15.80	16.55
1986	16.55	16.70	**16.70**									

HISTORICAL CONVERSION VALUES

Determined as of the last day of the month indicated (US Dollars/lb. U in UF_6)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	1.20	1.20	1.20	1.40	1.15	1.15	1.15	1.10	1.10	1.10	1.20	1.20
1982	1.20	1.20	1.20	1.20	1.00	1.00	1.00	0.90	1.10	1.60	1.45	1.45
1983	1.20	1.40	1.40	1.20	1.20	1.20	1.10	1.10	1.00	0.60	0.60	0.60
1984	0.60	0.30	0.80	0.80	0.80	0.00	0.00	0.80	1.00	1.00	0.80	0.80
1985	1.00	1.00	1.00	1.50	1.50	1.60	1.60	1.60	1.60	1.60	1.60	1.60
1986	1.60	1.80	**1.80**									

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GOVERNMENT STATISTICS

AUSTRALIA

	Price Index of Materials Used in Manufacturing Industry — All Groups[1] (1984 = 100)	Award Rates of Pay Indexes Australia — Adult Males In Mining Wage Earners, Weekly Rates[2] (1976 = 100)
1975 Avg.	150.4	132.6
1976 Avg.	168.4	160.9
1977 Avg.	192.0	179.0
1978 Avg.[3,4]	198.5	190.0
1979 Avg.	248.8	127.9
1980 Avg.	321.8	140.8
1981 Avg.	355.3	154.1
1982 Avg.[5]	368.6	174.9
1983 Avg.	401.6	181.8
Jan 1984	94.6R	188.5R
Feb 1984	95.4R	188.4R
Mar 1984	95.7R	188.2R
Apr 1984	95.8R	196.1R
May 1984	95.7R	197.0R
Jun 1984	95.9R	197.4R
Jul 1984	96.7R	197.4R
Aug 1984	97.9R	197.4R
Sep 1984	97.6R	197.4R
Oct 1984	96.8R	197.4R
Nov 1984	96.4R	197.4R
Dec 1984	96.2R	197.4R
FY84 Avg.[6]	95.3R	—
FY85 Avg.[6]	100.0R	—
Jan 1985	97.0R	197.4R
Feb 1985	98.6R	197.4R
Mar 1985	102.1R	197.4R
Apr 1985	104.4R	202.4R
May 1985	107.6R	202.4R
Jun 1985	108.7R	202.4R
Jul 1985	111.0R	202.4R
Aug 1985	110.5R	202.4R
Sep 1985	108.9R	202.5R
Oct 1985	109.6R	202.4R
Nov 1985	109.6R	209.8R
Dec 1985	110.2	209.9R
Jan 1986	109.8	209.9

P = Preliminary R = Revised since last month

[1]Australian Bureau of Statistics, Canberra: "Price Index of Materials Used in Manufacturing Industry" (Catalogue No. 6411.0). The basis of this index was revised to 1984 = 100. The previous index was 1969 = 100.

[2]Australian Bureau of Statistics, Canberra: "Award Rates of Pay Indexes, Australia" (Catalogue No. 6312.0). Figures for the latest fourteen months shown are subject to revision.

[3]Monthly data for 1970-78 appear on pages 4.7 and 4.8 of Report 138.

[4]Annual averages prior to 1979 reflect index base no longer in use.

[5]Monthly data for 1979-82 appear on page 35 of Report 184.

[6]Annual averages are for financial year ending June 30.

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CANADA

GOVERNMENT STATISTICS

	Industry Selling Price Index: All Commodities[1] (1981 = 100)	Wage-earner Data: Average Hourly Earnings (C$)[2]					
		Uranium Mines (SIC 057)	Metal Mines (SIC 051-059)	Mines, Quarries and Oil Wells[3] (SIC 051-099)	Primary Non-ferrous Metal Industries[4] (SIC 296)	(SIC 298)	Chemicals and Chemical Products[5] (SIC 370-379)
1979 Avg.[6]	217.9	—	9.60	9.66	—	—	7.67
1980 Avg.	247.2	—	10.58	10.80	—	—	8.50
1981 Avg.	288.7	—	12.02	12.23	—	—	9.53
1982 Avg.[7]	288.8	—	13.74	13.92	—	—	10.63
1983 Avg.	298.8	—	—	14.30	—	—	11.17
Jan 1984	305.4	17.74	15.27	14.74	11.91	10.84	11.69
Feb 1984	306.6	17.90	15.59	14.90	12.04	10.82	11.51
Mar 1984	308.7	18.05	15.52	14.82	12.14	10.84	11.58
Apr 1984	310.5	18.06	15.83	15.10	11.96	10.34	11.63
May 1984	310.6	18.48	15.64	15.06	12.11	10.16	11.65
Jun 1984	311.0	18.08	15.48	14.80	12.38	10.40	11.66
Jul 1984	312.9	17.81	15.72	14.92	12.53	10.18	11.82
Aug 1984	312.7	17.24	15.36	14.92	12.44	10.34	11.78
Sep 1984	312.3	17.68	15.96	15.34	12.51	10.52	11.90
Oct 1984	312.3	17.64	16.15	15.26	12.69	10.56	11.96
Nov 1984	313.6	18.04	16.13	15.43	12.47	10.51	11.96
Dec 1984	314.2	17.95	16.39	15.60	12.16	10.40	11.99
1984 Avg.	310.9	17.88	—	15.07	12.28	10.49	11.76
Jan 1985	117.5R	18.05	16.13	15.60	12.32	10.80	12.04
Feb 1985	117.7R	18.78	16.41	15.68	12.52	11.05	12.06
Mar 1985	118.4R	18.24	16.21	15.57	12.44	10.97	12.02
Apr 1985	118.3R	18.63	16.44	15.80	12.81	11.23	12.04
May 1985	118.6R	19.41	16.51	15.63	12.76	11.25	12.15
Jun 1985	118.6R	18.49	16.20	15.49	12.89	11.14	12.14
Jul 1985	118.6R	18.14	16.27	15.41	12.96	11.17	12.13
Aug 1985	118.4R	17.07	16.03	15.30	12.97	11.31	12.19
Sep 1985	118.6R	18.53	16.55	15.72	12.95	11.39	12.26
Oct 1985	118.9R	18.74	16.51	15.70	13.14	11.53	12.33
Nov 1985	119.2R	19.05	16.66	15.88	12.76	11.32	12.49
Dec 1985	119.9R	19.07R	16.57R	16.01R	12.51R	11.09R	12.59R
Jan 1986	120.7P	18.67P	16.44P	15.98P	12.80P	11.37P	12.53P
Feb 1986	120.5P						

P = Preliminary R = Revised since last month

[1]Statistics Canada, Prices Division, Ottawa: "Industry Price Indexes" (Catalogue 62-011). Indexes for the most recent six months shown are subject to revision. This category was formerly known as "Manufacturing." Index prior to 1985, 1971 = 100.

[2]Statistics Canada, Labour Division, Employment and Payrolls Section, Ottawa: "Employment, Earnings and Hours" (Catalogue 72-002).

[3]Reports 175 through 185 list this series title incorrectly as "Metal Mining, Including Milling (SIC 050-099)."

[4]Beginning with the April 1983 figure, Primary Metal Industries, non-ferrous is split into SIC 296 and SIC 298.

[5]Chemical and Chemical Products prior to April 1983 was SIC 370-379. The new series is from a new survey which includes all companies and is based on a 1970 classification. The old survey only included companies of 20 employees or more.

[6]Monthly ISPI for 1977 and 1978 appear on page 4.10 of Report 138, and monthly wage-earner data for 1973-78 appear on page 4.11 of Report 138.

[7]Monthly data for 1979-1982 appear on page 37 of Report 184. On that page, the wage earner index entitled "Metal Mining, Including Milling (SIC 050-099)" should read "Total Mining (SIC 051-099)."

[8]Beginning with the April 1983 figure, Wage Earner Data are based on a census of all companies employing 200 or more wage earners, *plus* a random survey of companies employing fewer than 200 wage earners. Prior to April 1983 only companies employing 200 or more wage earners are included in the Wage Earner Data.

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GOVERNMENT STATISTICS

REPUBLIC OF SOUTH AFRICA

		Average Declared Working Costs per Metric Ton of Gold Ore Milled (Rand)[1]	Tonnage-Weighted Index of Average Working Costs per Metric Ton of Gold Ore Milled (March 1982 = 100)[2]	Consumer Price Index[3] (1980 = 100)[4]	Producer Price Index All Groups[5] (1980 = 100)	Total Employment in Mining and Quarrying (Code 35)[6]	Total Salaries and Wages in Mining and Quarrying (1,000 Rand) (Code 40)[6]
1975	Avg.	16.71	—	157.2	100.0	639,473	1,003,617
1976	Avg.	19.30	—	174.7	115.1	671,240	1,212,983
1977	Avg.	23.87	—	194.4	130.0	712,006	1,420,670
1978	Avg.	27.14	—	137.2	142.7	664,571	1,537,169
1979	Avg.[7]	30.18	—	155.3	164.5	692,209	1,830,632
1980	Avg.[8]	35.53	—	176.7	192.1	714,379	2,279,615
1981	Avg.	41.89	—	206.5	218.3	728,506	2,820,505
1982	Avg.[9]	47.25	104.2	233.5	248.7	707,552	3,246,071
1983	Avg.	51.87	115.0	262.2	274.8	696,579	3,644,772
Jan	1984	—	—	274.7	283.3	689,807	326,619
Feb	1984	—	—	278.4	286.5	702,553	335,906
Mar	1984	55.30	123.1	281.9	288.0	715,628	342,332
Apr	1984	—	—	286.1	290.2	712,963	327,550
May	1984	—	—	288.3	292.6	710,040	327,937
Jun	1984	56.95	126.2	291.2	295.3	717,009	347,121
Jul	1984	—	—	295.1	296.0	717,121	369,964
Aug	1984	—	—	297.0	300.8	721,905	361,357
Sep	1984	60.64	133.2	299.9	304.1	721,470	359,218
Oct	1984	—	—	303.7	308.7	717,865	363,755
Nov	1984	—	—	307.4	312.8	717,396	369,771
Dec	1984	62.92	138.6	309.4	315.9	701,198	365,234
Jan	1985	—	—	177.1	166.6	711,366	376,777
Feb	1985	—	—	182.8	171.3	727,932	361,823
Mar	1985	64.48	142.4	183.6	173.0	708,809	371,380
Apr	1985	—	—	187.4	174.0	724,187	369,005
May	1985	—	—	189.5	177.7	708,085	373,478
Jun	1985	67.42	148.9	191.9	179.2	724,587	395,543
Jul	1985	—	—	193.6	180.7	738,228	419,106
Aug	1985	—	—	195.6	183.2	734,121	416,777
Sep	1985	70.47	155.3	197.8	184.8	732,836	419,883
Oct	1985	—	—	200.8	188.1	720,071	—
Nov	1985	—	—	203.4	196.0	750,049	—
Dec	1985	72.43	160.1	207.4	199.4	740,895	—
Jan	1986	—	—	213.8	203.6	—	—
Feb	1986	—	—	215.8	203.6	—	—

[1]Chamber of Mines of South Africa, Johannesburg, "Analysis of Working Results," published quarterly.

[2]Page 16 of Report 178 contains description and calculation of index, and page 24 of Report 178 lists figures for 1982.

[3]Republic of South Africa Department of Statistics, Pretoria; "Government Gazette: Consumer Price Index for Urban Areas."

[4]The basis for calculation prior to January 1985, 1975 = 100. For annual averages prior to 1978, April 1970 = 100.

[5]Previously known as the Wholesale Price Index, now the Producer Price Index. The computation remains the same. The basis for calculation prior to January 1985, 1975 = 100.

[6]Bulletin of Statistics, Department of Statistics, Pretoria.

[7]Historical data for the Average Declared Working Costs and Consumer Price Index 1970-1979 appear on page 4.9 of Report 140.

[8]Monthly data for Codes 35 and 40, 1977-1980, appear on page 28 of Report 157.

[9]Monthly data for 1979-82 appear on page 39 of Report 184.

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UNITED STATES

	Producer Price Index[1]		Consumer Price Index[2]	GNP Implicit Price Deflator[3,4]	Gross Average Hourly Earnings of Production or Non-supervisory Workers (US$)[5]			
	Industrial Commodities (1967 = 100)	All Commodities (1967 = 100)	(1967 = 100)	(1982 = 100)	Metal Mining (SIC 10)	Primary Non-ferrous Metals (SIC 333)	Chemicals and Allied Products (SIC 28)	Electric and Electronic Equipment (SIC 36)
1980 Avg.[6]	274.8	268.8	246.8	178.64	10.26	10.63	8.30	6.94
1981 Avg.	304.1	293.4	272.4	195.51	11.55	11.98	9.12	7.62
1982 Avg.[7]	312.3	299.3	289.1	207.15	12.33	12.94	9.96	8.21
1983 Avg.	315.8	303.1	298.4	215.63	12.57	13.43	10.59	8.65
1984 Avg.	322.6	310.3	311.1	108.1	13.05	13.43	11.08	9.04
Jan 1985	322.9	309.5	316.1	—	13.29	13.70	11.39	9.33
Feb 1985	322.5	309.2	317.4	—	13.30	13.73	11.39	9.33
Mar 1985	322.6	308.7	318.8	110.4	13.29	13.95	11.37	9.39
Apr 1985	323.8	309.3	320.1	—	13.43	13.62	11.48	9.40
May 1985	325.3	309.8	321.3	—	13.24	13.59	11.46	9.39
Jun 1985	324.8	309.2	322.3	111.3	13.23	13.66	11.52	9.46
Jul 1985	324.4	309.0	322.8	—	13.45	13.82	11.60	9.47
Aug 1985	323.7	307.3	323.5	—	13.55	13.69	11.62	9.50
Sep 1985	322.3R	305.5R	324.5	112.1	13.44	13.66	11.67	9.55
Oct 1985	324.2R	307.9R	325.5	—	13.49	13.64	11.72	9.56
Nov 1985	325.0	309.7	326.6	—	13.49	13.95	11.82	9.61
Dec 1985	325.2	310.2	327.4	113.0	13.43R	13.78R	11.87R	9.68R
Jan 1986	324.0	309.0	328.4	—	13.43P	13.69P	11.86P	9.62P
Feb 1986	319.4	304.7	327.5	—	—	—	11.84P	9.60P
Mar 1986	—	—	—	113.0	—	—	—	—

P = Preliminary R = Revised since last month

[1]US Bureau of Labor Statistics, Washington, D.C.: "Producer Prices and Price Indexes," (formerly "Wholesale Prices and Price Indexes"). Producer Price Indexes are revised four months after they are first released to reflect the availability of late reports and corrections by respondents.

[2]US Bureau of Labor Statistics, Washington, D.C.: Consumer Price Index for All Urban Consumers, US City Average, All Items.

[3]US Department of Commerce, Washington, D.C.: Bureau of Economic Analysis, National Income and Wealth Division: "S rvey of Current Business." The GNP Implicit Price Deflator is published quarterly, and seasonally adjusted.

[4]The basis for calculation of this index was revised to 1982 = 100. 1984 and 1985 figures have been adjusted to that basis. The basis for calculation prior to 1984, 1972 = 100.

[5]US Bureau of Labor Statistics, Washington, D.C.: "Employment and Earnings." All data based on 1972 revision of SIC Manual. Data for 1970-1976 are adjusted to the March 1977 benchmark. Data for 1977-1978 are adjusted to the March 1979 benchmark. Data for January 1979 and beyond are adjusted to the March 1980 benchmark.

[6]Monthly data 1970-1978 for Producer Price Index-Industrial Commodities, Consumer Price Index, and Employment and Earnings SIC codes 10, 333, and 28, and quarterly data for GNP Implicit Price Deflator appear on pages 4.6-4.8 of Report 139.
Monthly data 1977-1978 for Employment and Earnings SIC Codes 10, 333, and 28 appear on page 33 of Report 147.
Monthly data 1970-1978 for Employment and Earnings SIC Code 36 appear on page 23 of Report 154.
Monthly data 1977-1980 for Producer Price Index-All Commodities, appear on page 21 of Nuexco Report 158.

[7]Monthly data 1979-1982 for all listed indices appear on page 41 of Report 184.

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